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PARÁ AND THE AMAZONS (IN 1888).

BY

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Ships going to Pará, as a general rule, lay their course so as to make a land fall at or near Point Salinas Light, the reason being that off the Point lies the pilot-boat. Salinas consists of a few houses and the light-house, and is about thirty miles to the southward of Bragança Shoal, which lies at the entrance of the Pará River. The pilots are all Indians, civilized, of course, and very good men in their way. They wear a blue uniform with brass buttons, and the sharpest of Brazilian sharp-pointed shoes, and altogether they are great dandies.

Having sighted Salinas and taken on our pilot about ten o'clock in the evening of a June day in 1888, our passengers were much surprised the next morning to find themselves rolling about outside Bragança Shoal, instead of being well up in the Pará River. It appeared that, being unable to find the light-ship stationed on the bank, the ship had come to anchor to wait for daylight. About five o'clock we commenced moving, and after several miles we passed a small Brazilian schooner at

anchor, which proved to be a temporary light-ship, the other being at Pará for repairs. This vessel at night showed a small light, visible, perhaps, three miles, whereas the shoal extended ten miles beyond. No trouble had been taken to send down word to the pilots, and ours, who had been on the station six weeks, was, of course, ignorant of any change.

As we moved up the river land began to appear on the south side, mostly a tangled mass of palms, with here and there a bit of sand gleaming in the tropical sun. The north shore is not visible till one gets quite a little way up, when the banks of Marajo Island appear, showing the same tangled mass of palms, vines and mangrove bushes, all struggling, fighting, killing each other even, in their endeavors to obtain a share of the life-giving sunlight. The river itself is full of yellow mud, which gives it a rather sullen look.

Standing on the bridge one begins to notice a faint, deliciously exhilarating perfume in the air, growing stronger the farther up the river we proceed. Take in all you can while you can, you will never have another chance unless you enter Pará River from the sea again. It does not exist in any of the other parts of Brazil and the breezes of Ceylon are the only things that approach it.

Small fishing boats pass by, rigged with two masts, and their bows and sterns at right angles to their sides, with the whole family as crew, most of them naked, their bronze skins glistening in the sun. Now and then a palm-thatch hut appears, and farther up several brick and tile factories, the houses painted many colors and with red tile roofs. The little round fort appears in

sight with a few antiquated guns frowning from the battlements, looking as if they would explode if they were fired. They were fired some years ago when the Emperor paid a visit to his northern capital, and it is said that no powder being forthcoming from the magazine or the town, the Emperor had to wait at the bar twenty-four hours while he sent up powder for his loyal, if careless, subjects, to salute him with.

A ship, on coming to anchor off Pará, is immediately surrounded by Portuguese boatmen, who, as soon as "pratique" is given, commence calling and shouting to the passengers to employ them in going ashore. Their boats are broad, very strongly built and capable of carrying great weight. Many of them are built in Portugal and imported into Brazil; those so built being considered stronger and better made. The boatmen themselves are almost entirely Portuguese, and as a rule are a very trustworthy and hard working lot of men. They come to Brazil with very much the same purpose that the Chinese have in coming to America, namely, to make enough money in a few years of hard and unremitting labor to enable them to return to Portugal and live in ease and enjoyment. They are very sober and frugal in their habits, and soon leave the water to become small shopkeepers and the like. Steam launches also come out filled with officials, foreigners, and the principal merchants of the place to look after business, but also to get iced drinks. Though there are so many foreigners in Pará, and so much foreign intercourse with the place, there is no ice made or imported there. There used to be an ice factory, but it died from lack of patronage; there not

being enough consumed by the foreigners to make it pay, the Brazilians using it hardly at all. It is rather trying on a freshly landed stranger to be in a place as hot nearly as New York in July or August and be unable to get a cool drink of water, beer, or anything, for love or money. It seems strange that the native water jars should not be made of porous clay like the "chattis" of India and, in fact, the Eastern world generally. After four or five days' enforced abstinence, however, one gets used to it, and after a month or six weeks ice is rather distasteful, if anything, or at any rate is not looked upon as a prime necessity.

The water opposite Pará is about a mile wide, but the other shore is several miles further, and not visible because of the large islands which intervene. In fact, between Manáos and the mouth of the Amazon the two banks are not seen save at Ita Coatiara and Obidos. It should be said here, perhaps, that the Pará is not a mouth of the Amazon, but rather of the Tocantins, although they are all connected by small channels. The tides here are so strong that at times it is impossible to pull boats against them, and it is at any time a difficult task. For this reason steam launches are in great demand, and all the shipping-houses have them. Steamers wishing to go to sea must always wait the flood tide.

To leave the shore at any time, permission must be had from the Custom-house officials, and after eight o'clock in the evening a small tax must be paid, in the shape of an internal revenue stamp, which must be delivered on board the guard-boat anchored in the stream.

The city of Pará, seen from the river, looks very

much like an Italian town. The Royal Palms (*Oreodoxa regia*) give it a tropical look, which it otherwise lacks. On the river side it has a sea-wall of solid masonry, extending the length of the town, and from this wall the wharves of the different steamboat companies are built. The better wharves (here called *trapiches*) are built of iron, with corrugated iron sheds upon them. To these wharves are moored numbers of river steamers, nearly hiding the whole front of the town. The squares lying along the water front are kept vacant as public parks; but nothing is ever done to them, and they are simply a tangled mass of uncut grass and weeds. Broken pieces of machinery, odds and ends, etc., lie in them, and have lain there for years. Indeed, in one square, the Praça da Constituição, lies a statue, full length on the ground, still in its wooden casing, just as it was shipped from Europe several years ago.

The streets are very narrow, so narrow, indeed, that there is hardly room for pedestrians to avoid the tramways that run in nearly all of them. They are quite well paved, with stone, and are kept remarkably clean. In some of them, however, the surface is very much curved, so that it is exceedingly uncomfortable to walk save in the very centre. The sidewalks are barely wide enough for one person, and are not considered a necessity.

South America is the paradise of tramways. No town of any importance, or which conceived itself to be of importance, would think of being without, at least, one; and they are very profitable, too; everybody rides in them to and from business, or the theatres or balls. Save the Ministers of State in Rio scarcely any one in

Brazil keeps a carriage, and even for pleasure in the cool of the late afternoon the trams are preferable. They are called *bondes* (singular *bond*), from the fact that the bonds of the first one built were peddled on the street corners in Rio, and the Brazilians, not understanding English, mistook that word for the name of the thing itself. The cars are built mostly in the United States, and are generally of the open summer pattern. The gauge varies from two feet upwards. The rails used are the groove rails, and if well laid offer the slightest possible obstruction to crossing vehicles. Mules are the motive power. They are brought from the south of Brazil or imported from the River Plate countries, where the breeding of them is quite an important industry. They are very small, not any taller, but perhaps a little longer than the *burro*, so common in Mexico and the adjoining regions. The usage they receive is not of the kindest, nor the care of the best, but still they seem to thrive remarkably well. They are driven at a rate never less than ten miles, and often considerably more, an hour. The drivers are of mixed Indian blood, and take great delight in tooting their horns at every street crossing, and in whooping it up around the very sharp curves. Indeed it seems sometimes a question whether one will get around the corner safely, or be flung out of the car. The fares are arranged according to distances, and are somewhat higher than those which obtain in the United States. The conductor, in return for one's fare, gives half of a perforated ticket, though on the different lines different systems are in use, as the bell punch, while on some the ticket is collected at the end of the journey, and on others no record is kept at all.

The buildings of Pará, as a general rule, are not very fine, the handsomest being the Cathedral, the Custom-house (formerly a convent) and the theatre. The Cathedral inside is rather bare, except at the altar, which has recently had a hundred thousand dollars spent on it. The effect on the whole, is gaudy and lacking in pleasing qualities. The theatre is one of the largest and finest in South America, and formerly was renowned for its acoustic properties, but these have been improved out of it by repairs recently finished. It stands in the middle of a large open square, so that one can get a fine view of it from all sides.

One of the things that first strikes a person newly landed in Brazil is the want of verandas. It would not be so strange, perhaps, if the Spanish *patio* were common to the houses, but that is almost never seen. In the country, some of the larger *fazendas* have verandas, though even these generally are but poor affairs. The sloping red tile roof is universal, and rightly so in so wet a climate. It is easily put on, easily repaired, easily taken off, and affords excellent shelter from the tropical down-pours. It may sound strange, but it appears to be true, if one can believe statements made by both foreigners and Brazilians in high public stations, that that property in a roof the most desired is the one which allows it to be easily taken off; as there is a law that forbids the eviction of tenants for the non-payment of rent, and the remedy most in use to surmount this difficulty is the removal of the roof by the landlord under the pretext of repairs, when the first shower generally produces the desired effect.

The interiors are bare, and in general devoid of com-

fort or pleasantness according to our notions. The floors, of course, are generally made of the various hard woods of the country, some quite ornamental, and stand wear and tear very well. The walls are, for the most part, bare, and show only a great blank, white space, with perhaps a few cheap prints of some kind (the Saints seem to be the most popular subjects) nailed up here and there. Usually there are no ceilings, but if the house be of more than one story, the top one has no ceiling, and thus a greater circulation of the air is created, and this is conducive to the coolness so much sought after in warm climates. In the drawing-room, placed sharp up against the wall is a sofa or lounge, from each end of which, and at right angles to it, extend rows of stiff-backed chairs (not necessarily of the same kind), facing each other, so forming an alley up to the sofa, where the host sits and receives. All drawing-rooms, from that in the palace down, have this arrangement of sofa and chairs. The houses that are otherwise furnished in the French fashion are exceptions, and occur only in Rio and one or two of the larger coast towns, as Bahia or Pernambuco. It is a very poor house indeed that does not have at least one piano in it. It has been estimated that there are more pianos in Brazil, in proportion to the population, than in any other country, Germany not excepted. There is as much bad music drummed there, perhaps, as anywhere else, but there is no prettier light music composed than in Brazil.

The women of the upper classes are rarely or never seen in the street, and in fact scarcely leave their houses, except to go to the theatre or to a ball. As for shopping, they buy from samples the shopkeeper sends to

the house, or from peddlers or hawkers sent out on the streets for that purpose. The latter is the more common way. These men attract attention by clapping two flat sticks together, which make a sharp, clear sound that can be heard quite a distance. The women of the middle classes seem to spend most of their time gazing through the windows or leaning near the balconies, in loose wrappers, and expectorating into the street below, regardless of passers by. People usually walk in the centre of the street.

Servants are very bad, very high priced, and very hard to get. The necessity of having to work to live never having become a stern reality in their eyes, they consider it rather a favor than otherwise, in fact, quite a condescension to do anything at any price. A cook, for instance, and not a good one either, who comes at half past eleven in the morning, cooks your breakfast, and leaves between half past six and a quarter to seven at night, after cooking dinner, expects and gets from seventy (70$000) to eighty (80$000) *milreis* a month, *i. e.*, at present rate of exchange, about from thirty-five to forty dollars. He does not wash his dishes and would leave the place in an instant if asked to do it. None of the servants sleep in the house where they work. They come in the morning and leave at night by eight o'clock at the very latest. They are much given to stealing, and if detected do not feel the slightest shame, but rather upbraid the master and act as if he had interfered with some of their prerogatives. On the whole, they are very unreliable, and one can never tell whether one will go without breakfast or without dinner.

For foreigners, living is very expensive; all the arti-

cles that we consider necessaries being abominably high, and many of them even not to be had. Fruits are cheap, of course, but vegetables are very scarce. The food of the masses largely consists of dried native fish, salt fish imported from the United States, salt pork (called *toucinho*, and considered a great delicacy) and slabs of jerked beef. These, with rice and *farinha*, and one or two kinds of greens, are all the food one gets, except in towns like Pará, Santarem, and Manáos, and on the river steamers when a scanty allowance is given of potatoes and fresh meats.

The market of a tropical city is always an interesting and instructive sight. Here one may gain, perhaps, more actual knowledge of the minor products of a country, than from volumes of dry reports and statistics. The market of Pará occupies a building covering a whole square. The building is high and square, with an open court in the centre and roofed cloisters around the sides. On one side are the meat stalls, then, in no order, come fruit and vegetable stands, presided over generally by negresses, mulattoes, and women of various degrees of mixture of white, Indian and negro blood. One of the most common fruits is the blackberry of the Assai palm, looking like a large cherry. It is from these berries the celebrated drink of Pará, "Assai," is made. The berries are crushed in a bowl of water, with the bare hands, and then strained through a sieve of wicker work on to some fresh berries and the strengthened solution is strained again and ready for sale. It is considered a very healthful drink and is in great favor among all classes of the natives.

Right next to the market, in a sort of dock, lie num-

bers of trading schooners and small boats and canoes, brought from the interior by the Indians. Some of these come from as far as the provinces of Goyaz and Matto-Grosso. The voyage sometimes takes a month or two and as much or more to return. The crews are mostly of mixed blood, the Indian predominating. The cargoes consist of Brazil-nuts, mandioca and the like.

Almost all of the merchants and foreigners live in the suburb, Nazareth, which, being somewhat higher, is much healthier and cooler than the town. The best houses, as a rule, are on the Rua das Mangobeiras, so called from the beautiful trees which line each side of the street, almost meeting in the centre over head and forming a deliciously cool-looking and inviting promenade. In front of the houses are small gardens, conventional in style, filled with flowers and foliage plants, especially the latter, such as crotons, etc. This gives a very pleasing aspect to the rows of rather ugly houses. In the rear are enormous gardens, in which all kinds of fruits and vegetables that can be made to grow in the tropics are raised. Here, also, are kept the animal pets of all kinds, monkeys being far in the front as to numbers. The Barricudo monkeys are the greatest favorites, as they seem to be absolutely without any knowledge of biting; no matter how badly teased all they do is give a number of ear-piercing shrieks. The most curious animals are often to be seen as pets, such as *pacas*, *coatias*, *agoutis*, and even, though rarely, snakes.

The Brazilians are probably the most pet-loving people in the world, and their success in taming all kinds of creatures is incredible. The pets are treated as children of the family, and no one thinks of leaving home without

them. In every house can be found parrots in great numbers and of many kinds. A great many of them are never confined at all, particularly among the lower classes, where a small perch is stuck into the side of the street door, and on this polly makes his home. They never seem to fly away, even in the smaller villages, but to take to the more exciting and convivial life of the town. On the steamer coming down from Manáos, there were, among other things, two small jaguars, two tiger cats, monkeys galore, and birds, from the tiny paraquet to the enormous hyacinthine macaw, with its bill that breaks nuts, which are exceedingly difficult for a man to manage with a heavy hammer. There were also several snakes and chameleons, and one all-yellow parrot.

Another famous street of Pará is the "Palm Avenue," or Estrada de São Jose. This street is bordered on both sides by rows of enormously tall royal palms, and makes one of the most beautiful sights imaginable. But unfortunately, a few years ago the city authorities took it into their heads that the street ought to be paved with stones, and in paving the blocks were laid so near to the trees that their roots were cut, and in a short time this most imposing of streets will be no more.

The climate of Pará, although enervating, is less so than that of places farther up the Amazon, beyond the reach of the sea breezes. The thermometer has never been known to rise above 95° Fahrenheit nor to fall below 73°. The heat would not be oppressive but for the humidity of the atmosphere, which is such that one can never have dry clothes. Shoes left at night are mildewed in the morning, and as for starch or stiffness in one's linen, that is unknown. But even so, one is wakened at

about three in the morning by the comparative cold (say 75° or 76°) and is glad enough to get under a blanket. In the afternoon, at about four o'clock, comes the daily shower, lasting half an hour or less, and immediately followed by the sea breeze, which cools the air most deliciously. It is a curious thing that sunstroke is unknown in South America, while in India and the East Indies great precautions and care are necessary to guard against it.

Yellow fever is present for the most part of the year, but is never so severe as further to the south or to the north. It is curious what a bugbear it has become, whereas it is not contagious, and when well treated is not particularly dangerous. It kills more people by fright than in any other way. One never hears of the small-pox or leprosy, and yet the former is more prevalent than yellow fever. About the first of July, 1888, there were anywhere from fifty to seventy deaths a week at Pará from small-pox, yet no one thought anything about it, but if it had been yellow fever ships would have been quarantined. Any morning at that time when going into town one could see the small-pox patients sitting outside of the hospital doors, and on the edge of the town see them outside of their own huts wrapped up in a blanket or two. Later in July and August the small-pox rose almost to an epidemic, and another disease, which was at first mistaken for cholera, also came down the river from Peru. Several miles out of town is the lepers' hospital, containing a hundred or more patients. Having seen a great deal of this disease in other parts of the world, I did not visit the hospital. Beri-beri, a disease that causes the legs to become rigid and incapable of move-

ment, also obtains in all the tropical parts of Brazil. It is supposed to have been introduced from India, and is never seen outside the tropics. Change is about the only cure. Removal to a different room in the same house has been known to effect a cure, but more often a change of residence to another part of the town or to some other part of the country, and sometimes even a sea voyage beyond the tropics is necessary. Taking the climate of the Amazon region as a whole, it is considered by Orton more healthful than that of the Mississippi.

By the act of the 13th of May, 1888, slavery was abolished throughout the Empire. Slave-holders were not given any compensation. Some of the northern provinces, as Ceará and Amazonas, had already abolished slavery after having sold most of their slaves to the coffee planters in São Paulo. It was an act of necessity on the part of the owners, because of their inability to get a sufficient number of slaves since the suppression of the trade and also since the law of 1871, making all the children of slaves, born after the passage of the act, free. Free laborers and immigrants, moreover, would not work with the slaves. In 1887 the number of slaves in the Empire was 723,419, which must be taken as very correct, because no one who was not so registered could be held as a slave. The result of the act of the 13th of May has been an immense increase in immigration. In 1887 the immigrants numbered 54,990, and in 1888 over 130,000 arrived at the two points of Rio and Santos and the number for 1889 already promises to greatly exceed this. Italians form by far the largest body of immigrants into South American countries, to the wants of which they

seem to be better suited than perhaps any other nationality.

The population of Pará in 1883—the latest official statistics—was 40,000. Now it is in the neighborhood of 45,000, though some enthusiastic boomers have put it up to as high as 95,000. It is hard to get at the real figures, as the official population is only estimated. The pure whites are in the minority and negro and Indian blood, in all degrees of mixture, is seen on every hand.

There are several lines running boats on the Amazons, some going as far as Peru, and having branches going up the different tributaries. Of the river lines (in contra-distinction to those coming from Europe) the Amazon Steam Navigation Co., an English company flying the Brazilian flag, and receiving a subsidy from the general government, for which it makes two voyages monthly between Pará and Manáos, and also a subsidy from the provincial government of Amazonas for a third voyage, is the largest and best. It also receives a further subsidy from the general government for a monthly service between Manáos and Iquitos in Peru. This same company also has steamers running on the Rio Madeira to the Falls of San Antonio, a distance of 1,246 miles from Manáos; on the Rio Negro to Santa Isabel, 846 miles; on the Rio Purús to the cataract of Hyutanahan, 1,685 miles; on the Rio Juruá to Lake Marary.

By the Compagnie de Navigation Brésilienne de Manáos, subsidized by the Province, a steamer once a month from Manáos to the Acre, a tributary of the Purús, and up the Rio Javary, whole distance about 3,000 miles.

By the Compagnie de Navigation à vapeur de Manáos, which is under contract to the Province to make six trips a year to the rivers Purús and Acre with right to go on the Rio Ituxy; four trips a year on the Rio Juruá up to the Javancá; two trips a year on the Rio Jutahy; two trips a year on the Rio Javary.

Besides all these there are the Pará and Amazonas Company on the Lower Amazon and lines on the Tocantins, Xingú (pronounced, *shingú*) Tapajós and others.

Four lines from Europe also come up to Manáos and one of them has just commenced to run to Iquitos. These four are the Red Cross line, English, from Liverpool, stopping at Havre and Lisbon, making the voyage about once a month and subsidized by the Province which in return gets one 1st class and 15 3d class passages free; the Booth line, English, from Liverpool and New York and now running steamers to Iquitos, distant 2,500 miles, about, from Pará and also in receipt of a subsidy; the Compagnie des Chargeurs Réunis, French, from Havre, subsidized on same conditions as the Red Cross line, and giving further, a reduction of 30 per cent. on the price of passage to immigrants intending to settle in the Province of Amazonas. All these seagoing steamers are of very fair size, some being as large as 3,000 tons.

The fleet of the Amazon company consists of upwards of twenty-five steamers, almost all of them being English built, iron boats varying from 300 tons to 1,100 tons. Of these two only are screw, the rest being paddle boats.

The cabins are very narrow and are arranged to hold

four persons. Mattresses and pillows are furnished and also a wash basin. Water and towels are supplied on request as a great favor, with a man to see that they are not injured by too much rubbing. They are not considered as necessaries by the ordinary traveller on the river. The passenger capacity of these vessels is not limited by the number of berths or staterooms, which are seldom or never used except by the few foreign travellers to dress in, but by the limit of hanging room for hammocks. Everybody of necessity must have a hammock, as the staterooms are unbearable at night. Even in the hotels they are more used than the beds. Some of the hammocks are very fine; those made of maqueira grass with feather lace trimmings are considered the best. It takes from several months to a year or more to make really good ones and they bring anywhere from a hundred to five hundred dollars a piece. The feather work is most artistic and very cleverly put together. The feathers themselves are all of their natural colors and are taken from the most brilliantly colored birds that are to be found. The Indians of the Rio Branco region, on the upper Rio Negro, have a great reputation for this kind of work. These hammocks will last a lifetime, though in use every day and washed once a month. The most common kind are of German manufacture, made of cotton, and imported and sold very cheap. These, however, are very warm and keep out cool drafts of air. The best cotton ones are of native grown cotton and made in Maranhão. The grass hammocks are much cooler than any bed as they let the fresh night breezes come through their loosely woven meshes.

Coming back to the steamers, one may say that the

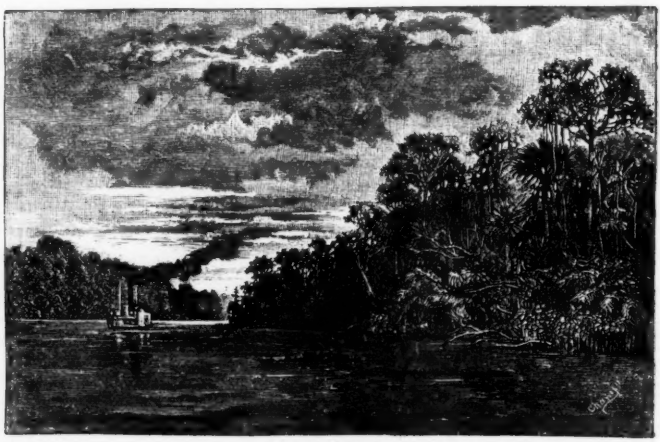
upper deck (the only deck first-class passengers have anything to do with), is kept beautifully clean, being scrubbed every morning with sand and bricks. The food is something frightful, and everything being put on the table at once, by the time people are seated some of the dishes have been waiting ten or fifteen minutes, and consequently are cold, and if they happen to contain gravy, so much the worse, for it is all congealed. Meals are served as follows: coffee and biscuit between six and seven in the morning, breakfast at half past ten, dinner at four in the afternoon, and coffee and tea at eight in the evening, with biscuits of various kinds. Table manners on the Amazon have not reached the desired point, since one's neighbor seeing a tidbit on one's plate thinks nothing of reaching over with his fork and transferring it to his own.

The crew are mostly Indians or half-breeds, and do their work very well. The captain, or commandante as he is called, has nothing to do except to cry out, "Larga, larga," coming into port and leaving it; in the first instance meaning to let go the anchor, in the second to let go some hawser or line to the shore. The pilots are the principal personages on board, and very clever they are, too. They take the boat through all the intricate passages on the darkest of nights, so dark that ten feet away from the bow of the boat nothing can be seen; and this when not all the channels are known to them, new ones being discovered every little while. On board the *Imperatriz Theresa* we had two, one an old Portuguese sailor, the other a young Indian, half white, of eighteen or nineteen years of age. He was a wonderful little fellow in his way, knew the river

as far as Tabatinga, the Peruvian boundary, over 2,000 miles, and would take the boat through the most intricate channels when it was so dark that a person was indistinguishable a yard off. He spoke a little English, having been a year at school in Philadelphia in 1883.

We left Pará at nine o'clock Sunday morning for Manáos. On leaving the wharves of Pará the boat crosses the stream in front of the town and rounding the point of an island enters the main stream of the Pará River. The boat remains too far out in the stream for one to get much of an idea of its banks, beyond a seemingly limitless expanse of palms and forest. The palms are more numerous on the lower part of the river near the sea than they are four or five hundred miles up. They always lend a pleasing and inviting look to the forest which no other tree seems to produce. Here they seem to grow in groves, while further along they are more apt to be isolated or to grow in clusters of different species. One may get some idea of their variety when it is remembered that they are more numerous here than in any part of the globe, the species found in the Amazon region numbering upwards of five hundred. The thickness of vegetation must be seen to be appreciated; it cannot be described, so tangled and snarled is it with undergrowth, vines, *cipos* and the like. Now and then one sees a hut made of thatched palm leaves with numerous brown and naked little children rolling on the ground or playing in canoes. There seem to be more women than men, though a great many of the latter are in the forest after rubber, or off fishing in some quiet creek. The first stop was at Breves, where we arrived at three o'clock in the morning. The town was all

asleep, and nothing much could be seen from the boat. From Breves commences the beautiful part of the river, which extends as far as Santarem (pronounced Santaréng). The boat goes through narrow, winding channels, the branches on both sides brushing against the paddle boxes. In the cool of the early morning, before the sun has barely risen over the top of encircling forest, it seems as if fairy-land had been reached at last.



Breves Channel.

Every leaf is wet from the heavy dews or shower of the night, and the most brilliantly colored birds fly back and forth, all glistening in the sunlight. The sporting passenger can amuse himself shooting at ciganas, with their beautiful iridescent bronze coating, or white ibises, which appear roosting on every floating log. The ciganas are a sort of stinking pheasant, and as may be supposed from their name, are not good eating. This scenery lasts all day, in fact, it may last for days if one

does not follow the main stream. Of course at the end of the dry season a great many of these channels are too shallow to be used.

In the evening we reached the small village of Gurupá, and stopped just long enough to leave and collect the mails. When we left there it was quite dark and about an hour afterward we entered the Amazon proper. Nothing of the banks could be made out, of course, except that the channels were a little larger. Some idea of the size of the Amazon may be gained from knowledge of the fact, that there are about 25,000 miles of navigable waters for ocean-going steamers, and over 45,000 miles for light-draft river boats. Sailing ships have been, and can go to Iquitos, in Peru, a distance of 2,500 miles from Pará.

Early the next morning we were at Porto de Mos, a village on the Xingú. The houses were mostly very tumble-down affairs, though one of more prosperous appearance than the rest was built of glazed tiles, and, with its wood floor and few cane chairs, looked very luxurious in comparison with the rest with their filthy mud floors. The two churches of the town appeared much neglected, quite good sized plants growing out of the crevices between the stones in the wall. Perhaps they gave it rather a better effect than otherwise, as the architectural beauty of the building was not great. The bells were hung to a cross beam resting on two upright poles placed just outside the main entrance. The churches, generally, on the Amazons, are very much out of repair and religion is rather at a discount save for fête days which give an excuse for all hands to get drunk on the frightful-tasting but otherwise harmless

and healthful *cachaça*, a rum made from the sugar cane. The priests are, perhaps, the most immoral of the whole population. There are some exceptions, of course. I met one who was said to have forty-two children whom he acknowledged. Some allowance may be made for him, however, when it is taken into consideration that he was three-quarters negro and had never been even as far as Pará.

Every little village, no matter how small, has its billiard hall, and they are always pretty well filled. It is the most popular game on the Amazon. The tables are not the best, and mostly come from France. The game is played with some odd, complicated methods of scoring peculiar to Brazil.

One of the inhabitants of Porto de Mos had as pets a pair of birds, the size of young turkeys, called Jacamim. They were very tame, as is usual with Brazilian pets, and allowed themselves to be handled by any one. Their heads, necks and under parts of their bodies look and feel like black silk plush. The backs and wings are covered with greenish-brown feathers, very fine, hair-like almost, similar to the feathers of some birds of Paradise. They make a curious groaning noise if disturbed.

In all of these river towns is stationed a guard of municipal police. The uniforms are similar to those of the army, excepting the cap, and the men are armed with sword or rifle.

Any one who can scrape together a dollar or two can get a gun. But such guns! Made of tin or old scrap iron, put together in the flimsiest way imaginable. It is a wonder that there are any inhabitants left at all.

The Xingú is a black water river, and in leaving Porto de Mos we crossed the line from that into the yellow waters of the Amazon. The line is very distinct, so distinct indeed, that one could lay a pencil down and on one side would be black water and the other yellow, or "white" water, as it is called. The waters of the Tapajós are also black, but it and the Xingú differ from the black water of the Rio Negro. The former is a brilliant blue-black, while that of the latter is more of a dark bronze.

At some little distance from Porto de Mos the forest is neither so high nor so dense as below, and at intervals come open spaces called *campos*. These have horses, sheep and cattle on them, and give quite a pleasant variety to the scenery. The palms begin to get less numerous also, the farther we leave the sea behind. Over some of these *campos*, far to the north, can be seen a low cluster of hills. These are on the northern bank of the river and are the first high land seen in going up the stream.

A short stop was made at Prainha at 2 o'clock the next morning for the mails. It seems a pity that so many stops should be made in the night time, but as the year's quota of travellers can be counted on one hand, it would not pay to consult their wishes only.

After breakfast we saw Monte Alegre in the distance, nestled on the hillside. It looked very attractive with its red tile roofs and the church, which stood out quite plainly, but that "distance lends enchantment to the view" is especially true of Brazilian towns.

The first alligators were seen this morning, but they do not begin to be plentiful until above Santarem. This,

however, is not the proper season for them, as the waters are too high, and there are very few beaches left for them to bask on, while a great many are hibernating.

For the first time we were troubled with mosquitoes, but luckily a breeze came which drove them away. However, they are not a circumstance to some of the other insects, as *piums* or *mucuims*. These leave frightfully itching bites that last for five or six months, and in case of *mucuim* bites, the flesh swells and becomes like putty, and by pressure of the fingers, dents are made in it that last half an hour or so.

Among the freight on board were a lot of American rocking chairs and Singer sewing machines, going away up river beyond Manáos. Both these articles are in great demand, and one finds them in most unexpected places.

We arrived at Santarem at eight in the evening, and everything was closed save one or two billiard halls. The town had a very pretty effect in the moonlight with its sand beach. The scenery for some distance below the town is simply enchanting. The country is a trifle more open, and the trees are fairly covered and festooned with ivy-like vines, giving a marvellous soft effect. Lagoons were quite frequent, too, and were covered with flocks of white ibis and blue herons.

The houses of Santarem are very well built; the streets are clean and are lighted with kerosene lamps. The town has quite a trade in rubber and drugs, brought down from the headwaters of the Tapajós and transhipped to Pará or Europe direct. It is just back of here that the American colony settled just after the war. On the whole it has not been a success, and only about twenty remain, and of these but three or four are accom-

plishing anything at all. The rest are anchored here, as it were, from their inability to get away. The land is fertile enough, but labor is high and difficult to get, and slaves could not be made to work, as they would run away to the forest, lose themselves, and never be seen again. The slaves in these northern provinces, practically, did as much work or as little as they liked.

The town of Alemquer was passed during the night, and in the morning we were in the cacáo region. We went along the whole day within fifteen or twenty feet of the bank, and past "sitio" after "sitio" of cacao. This country was the most thickly populated of any we saw. The houses, quite substantial affairs, made of heavy logs and plastered with mud, generally have a garden in front, containing a few brilliantly colored plants and flowers, with a few cocoa-palms and a banana patch. They seem to be overrun with children of all ages and colors. Birds of all kinds seem to become more plentiful also. Castor-oil trees by the thousand, monguba trees and the beautiful mangeiras trees are also common. In 1863 a traveller by the name of Gustave Walles discovered on the Rio Branco, a monguba tree, the trunk of which rose one hundred and fifty feet to the first branch, while the circumference of its crown was 815 feet, and it cast a shadow of 5,416 square yards. It is estimated that 10,000 men could camp under it.

In the afternoon we reached Obidos, and for the first time saw both banks at the same time. The river is only a mile wide, and its immense volume of water rushes past at the rate of six miles an hour. Bottom has not yet been reached in the channel by the soundings that have been taken. The town is situated on a

steep bluff, and half way down is an old stone fort, containing a few superannuated guns, of no earthly use, and manned by half-a-dozen soldiers or so. It being the "festa" of Bom Jesus, flags were flying, the church was newly painted and a stand had been erected in the square, where they were to have music and fireworks to last three days. Nothing can ever be done in Brazil without fireworks. The band was practising and every one seemed to be playing a composition of his own.

On the highest piece of land in the town, a situation commanding a most magnificent view up and down the river, stood a large one-and-a-half story house, sixty feet wide by about one hundred deep, with a very large garden behind it, the whole for rent at thirty milreis (fifteen dollars) a month. It was very well built, had been vacant for a long time and there was no prospect of renting it.

One of our passengers lived here and he invited us to see his house and shop. Both were in the same building. He sold mostly dry goods and notions of all kinds. The living part was a very poor affair, but above the average Brazilian house. The garden behind it was the best part of it, and he seemed to think so, too. It contained roses, jasmines, bananas and a few grape-vines, which he said were imported from America. Nailed up on one side of the door was a large skin of an ant-bear which his son, a lad of thirteen years, had killed a few days before.

We took some horses and cattle on board here for the upper river. The horses had a broad leather belly-band put under them and then were swum out to the

ship and hoisted on board by the donkey engine. It was a much simpler affair with the cattle, which were swum out with merely a grummet around their horns, by which they were hoisted on deck. They all seemed to take it very coolly. The cattle seemed to know exactly when they could stand on their feet again, but the horses had to be let down till they touched the deck, with their legs all limp, when immediately there was a great scrambling to find their feet. They were about the size of a large polo pony, and though not handsome looked wiry and tough. The cattle were of medium size only.

Early the next morning we came to anchor off the cacao sitio "Amisade." The proprietor was a large, strong, jolly Portuguese, who looked as if he did not know what liver meant. After having carefully sent all his women out of sight he asked us ashore to look over his plantation. The house was like all the sitio houses. In the shop, by means of which he kept all his laborers in a state of perpetual peonage, were all those articles necessary to a country where there are not shops, sometimes for more than a day's journey, knives, calicoes, every sort of thing to attract the eye of the ignorant Indians.

The cacao is a large shrub, its stem often growing as large as seven or eight inches diameter. When a plantation is first started it is planted from the seed and lasts for thirty or forty years, new shoots springing from the stumps of the old ones as they die and decay. The fruit is yellow, in shape something like a cucumber or bobbin, and it grows directly from the main stem. In the centre of it are the beans

in a row, covered with a thick white substance, which is sweet but insipid. A wine is made of this which is very popular in the cacao regions. The beans are dried and packed in a way that brings less money than if more care and trouble were taken. But the people are too lazy to work more for an increased profit, when the profits are large in any case and the conditions of life so easy. This man expects to retire to Portugal soon on a comfortable fortune, after a residence of less than fifteen years on the plantation. The rind of the cacao fruit is burned and from the ashes they make a most excellent soap, called *sabão de cacáo,* which is good, especially for taking out stains, and it is said is the only thing that will take out iron rust without injury to the cloth. Nearly all the cacao of this region, which is considered finer than that grown anywhere else, is sent to France. All the poorer grades and that grown near Bahia come to the United States. Why this is so I have been unable to find out.

If one asks any of the women on these rivers who are the fathers of their children, they give the same answer as twenty-five years ago they gave to Mrs. Agassiz, "They are the children of chance, senhor." The immorality of these North Brazilians is simply beyond conception. A Brazilian will introduce his children as legitimate and illegitimate, as the case may be, and they all live together. If a person dies who is legitimate, be sure it is put on his tombstone, whereas, if otherwise, nothing is said about it. The mixture of races is probably one of the causes of all this. In one family often may be seen children varying from black to white and some of them showing traces of Indian blood. In nine

cases out of ten the children are weaker than their parents in every way.

On leaving the sitio we took in tow a small *montaria.* Evidently we ran into a school of fish, for numbers of them frightened by our passage through the water began jumping out of the water to a height of four or five feet, and in fifteen minutes enough had fallen into the *montaria* to be served for luncheon to all the ship's company. A pair of fresh water dolphins began disporting themselves in the water, exactly like their relatives of the sea. This is the only kind, and this the only place, where these fish are found.

The next stop was Serpa, or as it is now called Itacoatiara, meaning painted rock. This small town has gone through various vicissitudes, as moving from one side of the river to the other several times and changing its name to Serpa and Itacoatiara, back and forth, three or four times. It has a large trade in castanha nuts, or as we know them Brazil-nuts. In going down the river we took on over sixty tons of them at one shipment.

An American has a fazenda here. Tradition has it that he first came out thirty years ago as a Methodist missionary, then became a trader, and finally settled here. There are about four hundred acres cleared, all told. Though the meadows look in no wise different from our best farming land, he said that it cost him about fifteen hundred dollars a year to keep them clear, and if he neglected them for a month, it would take two or three months to get them into condition again, so fast does vegetation spring up in this region. Cattle and tobacco are his principal productions. The former are of very good size, averaging, say, one thousand pounds, and their

meat was good. He sells most of them to the river steamers, as, although he has the only cattle in the town, there is no call for meat, except very occasionally when enough people club together and buy a whole steer. The tobacco is one of the strongest in the world, and sells quite well in Pará among the poorer classes, but it has not the delicate flavor of the Pará product, which is probably the best cigarette tobacco in the world, though the South Brazilians prefer that of the Rio Novo.

One morning we were apprised of our near approach to Manáos by meeting more steamboats than we had seen altogether before, some bearing such familiar names as Mississippi and Ohio. Rounding a bend of the river we saw a broad expanse of black water stretching away to the horizon on the right. It was the Rio Negro. Seven miles from its mouth lies Manáos. Having dropped anchor in front of the town, we were visited by the board of health and the custom officials, for each province has its own custom-house and levies duties on all articles passing through it even, unless destined for a foreign port. They did not interfere with us at all, however, as soon as they found out we were only travellers bent on seeing the country. Manáos is rather well situated on high ground, rising gently from the river. There is a very fine view of the river and some islands lying four or five miles out that can only be seen during a rain storm. The town has about 15,000 inhabitants, and is quite a thriving place. It is very centrally placed, being at or near the junction of the three rivers Rio Negro, Rio Madeira, and the Solimões or upper Amazons. Rubber, of course, is its principal item of export, but it levies tribute on cinchona bark from Peru, which is here transhipped to Eu-

ropean steamers. It is feared that since one line from Europe has commenced running to Iquitos, others will follow suit and ruin the trade of Manáos. It would still have the trade of the Madeira and Rio Negro to fall back on, however, and if the railroad is ever built around the Falls of San Antonio, it would more than make up the loss.

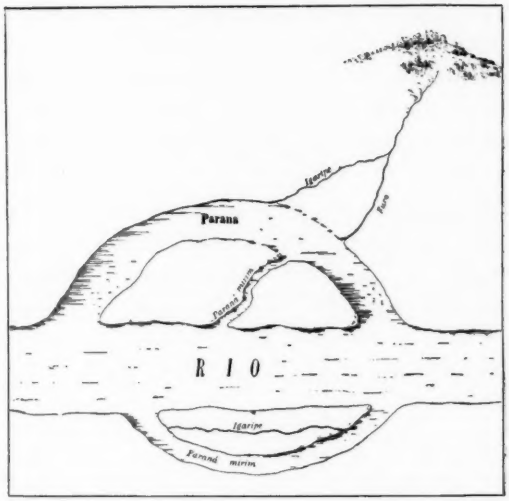
The cathedral is the most prominent building seen from the river. It was contracted that it should be of white marble, but it seems that there are "boodle" provincial deputies in Brazil as well as at home, for it is nothing but brick, and a good deal of it sun-dried at that, stuccoed over. The contractors are supposed to have cleared $200,000 on the transaction from the Province. It seems to be the general rule with foreign business houses in Brazil as soon as a man goes into politics to take his name off the books and have no more to do with him in a business way, as they say that once in politics, one can depend on them no longer.

There are here a school for education of Indians, a normal school, a seminary, fifteen public primary schools, and many others of various grades. Not half of them are used, but serve the purpose of keeping numbers of young Brazilians from working, who think it degrading to do any sort of work except in some government position where often the only work is to draw their salary when they can. As one would suppose, education is very backward and the few that can read and write know hardly much more. The children are taught in the oriental method, *i.e.*, the whole school shouting out their lessons all together, the words, not their meaning, being dinned into their heads by ceaseless repetition.

Manáos is also a naval station for gunboats on the upper Amazon. The boats are mostly small, shallow, wooden steamers, of not great speed, but still quite sufficient to overcome their only likely foes, the Indians. One of them was designed and built here, and when finished was found to have been turned end for end, so they fixed a rudder on what should have been the bow, and so she stands to this day. The discipline is best shown by the complete absence of it. Although the officers spend six years in a naval school, it is no uncommon thing for them to get lost out of sight of land. In fact, three several times, men-of-war carrying prisoners to Fernando Noronha, have returned to Pernambuco, reporting that the islands must have disappeared as they could not find them. The ironclads, splendid ships most of them, rarely or never leave the harbor of Rio, and one had lain there so long that one day she was reported sinking, and upon examination it was found that her plates had been eaten through by the action of the salt water.

In reading books on the Amazon, one is often puzzled by names of various pieces of water spoken of, as, "furo, paraná, paraná-mirim," etc. These are not proper names, but generic names of different kinds of streams as shown in the plan prepared from data furnished by the Commandante Rufino Tavares and the two pilots of the steamer *Imperatriz Theresa.*

The word "rio" corresponds to our word river exactly. "Paraná" means a channel of a river, encircling a piece of country more or less large, and its waters, those of the river, increased perhaps, by streams falling into it, but having no proper source of their own. "Mirim, or Miri," as it is sometimes spelled and called, means little,



and consequently, "Paraná-Mirim," is simply a small paraná. A "furo" is a creek, or brook, or small river having a source of its own. An "igaripé," meaning literally a "canoe path," is a small stream of water having no source, but connecting any of the above with each other, and sometimes is like a "paraná-mirim," save that it is much smaller. Another thing that sometimes confuses one is a town having two names, as can be seen on any map of Brazil. Santa Maria do Belem is the right name, but it is called Pará, because it is in the province of Grão Pará. Pernambuco the same way. Its right name is Recife. São Salvador is called Bahia from its province. The money in use in the Amazon regions is paper treasury notes and nickel coins. In the south of Brazil silver is more common, but gold is at a premium. Up the river one is often asked to ex-

change certain bills for others of the same value, for it seems that every little while the treasury calls in certain issues, and any note of these presented after a certain date suffers a discount of ten per cent. and ten per cent. additional for each and every month afterwards till only ten per cent. of its face value is paid on presentation, and there it remains. In the far interior it is difficult to use paper money at all, as communication is so slow that sometimes the money is absolutely valueless before notice of its recall is received. The bills, by the way, as well as the stamps, are all manufactured in New York.

The following table may be useful:

A Table of Distances of Towns and Villages on the River Amazon between Pará and Manáos on the Rio Negro. Computed from a table used by the Commandante Rufino Tavares, of the Amazon Steam Navigation Company's Ship "Imperatriz Theresa."

Belem or Pará.

146	Breves.									
269	123	Turupá.								
317	171	48	Porto de Mos.							
413	267	144	96	Prainha.						
456	310	187	139	43	Monte Alegre.					
515	369	246	198	102	59	Santarem.				
552	406	283	235	139	96	37	Alemquer.			
612	466	343	295	199	156	97	60	Obidos.		
707	561	438	390	294	251	192	155	95	Parintins.	
844	698	375	527	431	388	329	292	232	137	Itacoatiara.*
954	808	685	637	541	498	439	402	342	247	110 Manáos.

Brazil, as a whole, is a country of limitless resources,

* Formerly called Serpa.

and the southern part is sure to grow in every way, but the Amazon, from its climate, and from the difficulty of conquering vegetation, will certainly be one of the last places in the world to fill up with colonists from the Old World, and if, as seems likely, a republic be declared after the death of the present emperor, this will be put off still longer, as from the great antagonism of North and South Brazilians, civil war is sure to follow.

THE SOUTH AFRICAN REPUBLICS.

BY

MISS A. RUSSELL.

The Boers who people the Republics of South Africa which lie north of the British Colonies of the Cape of Good Hope and Natal, between the Orange and Zambesi rivers, are descended from the early Dutch colonists, and French Huguenots, who made the first civilized settlement at the Cape of Good Hope in the middle of the seventeenth century.

The value of the Cape of Good Hope as a key to the East made itself apparent to all the nations who traded with that quarter, and England developed a great desire to possess it. After various indirect ways of trying to attain that end, the British Government added it to their dominion in 1806 by conquest. The early history of the English administration here is one long story of misrule and incapacity, and in relation to the Dutch settlers a purely despotic establishment which at length drove them to desperation, and bred in them a determined and fanatical desire to escape from it. This led them to abandon the Cape Colony in large numbers during the years 1835 and 1836. They *trekked* northward and formed a republic in what is now known as the British Colony of Natal, and later on the republics which lie northward to the Limpopo River below the 22d degree of South latitude. The British Government raised no opposition to these migrations of

the Boers, but permitted them to lay the foundations of civilized states in these wild regions and establish their own republican form of government, and then rudely fell upon them, dispossessing them and repudiating their claim to independence.

This is the history of the relations which existed between the English and Boers for over half a century in South Africa, until at length the English Government seemed to awake to the fact that this continual aggressiveness levelled at the poverty-stricken and downtrodden Boers was a profitless persecution, inducing neither peace nor prosperity to any condition, and pointing to no ultimate conciliatory relations, and, in 1852, granted a charter of independence, which freed them from the allegiance it could not compel them to acknowledge. As the result of this act, the Boers found themselves in undisputed sway from the Drakenberg Mountains on the south to the illimitable stretches of country which lie north of the Limpopo and on to the Zambesi River. In the years which ensued they realized a "Promised Land," a genial soil which produced in lavishness for a minimum of effort, and their flocks and herds increased and multiplied past computation. Within recent years these republics have developed mineral wealth which renders them one vast field for enterprise, exploration and capital, and the attitude of the English Government has at different times given rise to complications which, but for the spirit of the Boers, would have made them once more subjects of the great empire, on whose dominions it is boasted the sun never sets.

The sympathies of American people should be drawn towards these South African Republics, whose history is

in some points not unlike their own, and my hope is that through the streams of commerce which must ultimately flow between these kindred countries, a knowledge will be gained in this country of the South African republics which will forever set the Boers at rest on the score of the safety of their independence. As the advance of interknowledge grows between nations so will the spirit of the strong to dominate the weak lessen in power, and a higher ambition replace it; the ambition to compass the interests of mankind in perfect mutual relations, which is the only secure, as it is the highest type of bond between nations.

The history of the Boers and the struggles which they have waged with the English for independence, bring us to contemplate the work which their pioneering enterprise has accomplished in South Africa, opening it to civilization, which is gradually pushing its way to the very central regions of the continent.

A period of twenty years has elapsed since the first discovery of diamonds took place in West Griqualand, a province of the Orange Free State. During all that period the production of diamonds has given yearly a steady average, and recent statistics compute the total value in bulk to amount to £45,000,000. Within later years the production shows an increase, and the mines average an annual output that rather exceeds than otherwise £4,000,000 sterling.

The good old days have departed when each man had an allotment and mined for his own special behoof, while his wife or sisters took their share in the work by sorting, which was an employment to which they were admirably adapted, from the fact that it required more keenness and

mother wit than mere physical labor implies. Individual mining has been gradually pushed out of the competition, the claims by degrees drifting into the hands of companies, and the immense industry which diamond mining now forms in South Africa is directly controlled by one or two syndicates, and in these the Rothschilds hold magnificent interests. The camp of other years has made way for the pretentious architecture which wealth demands as representative of its power, and Kimberley, the capital of the diamond fields, is now a handsome city with a population of 20,000 souls. It is lighted by electricity, and tram cars intersect its streets, and generally its aspect is not widely different from that of a wealthy section of London.

Railway communication with the Cape of Good Hope, a distance of 647 miles, and a plentiful water supply from the Vaal River have greatly added to the comfort and cheapness of living there. The recent developments have quite changed the aspect of mining, the barriers which formerly divided the individual allotments have disappeared, and these have gradually merged until they form single mines of immense extent, the appearance of which is that of huge pits. The Kimberley mine would cover a space of eleven acres of ground. Looking at these pits from a distance, the intersection of ropes and chains which encompasses them throughout finds an apt illustration in a spider's web. By means of this complicated network the miners descend and buckets are worked backwards and forwards conveying the diamondiferous soil to the surface. The mines are worked to a depth of 500 feet, and from these extensions tunnelling is carried on in the same way as at coal mines, stretching under-

ground to a depth of 100 feet. The soil in which the diamonds are found is a blue clayey composition, and it exists frequently in the neighborhood of huge rocky boulders. The soil is taken from the mines, and at the surface tram cars convey it to open ground some distance away, and here hundreds of thousands of tons of it are spread out to dry, after which it is returned to the mines and washed.

The scientific theory with regard to the occurrence of diamonds in this flat and arid region is that in past ages of the world's unrecorded history there must have been an eruption far down in the depths of the earth, which threw up vast streams of boiling liquid mud from the craters below, and this ultimately resolved the carbon into the crystallized form which emphasizes the diamond. As a matter of fact this rests on no higher basis than supposition, and probably on that foundation also it is asserted that another half century will not see these mines exhausted, therefore the wealth which they represent is past the power of computation.

The spirit of rapacity which has characterized the action of the English Government in their dealings with South Africa led them to assert claims to the diamond fields. The justice of these claims has never been admitted, but their power to enforce them enabled them to secure possession, and this region is now a part of the British dominion. The extension of the diamond mining area in recent years has opened up some valuable mines in the Orange Free State territory, and on the banks of the Vaal River, a boundary which divides it from the Transvaal.

There are in existence old Portuguese maps of South

Africa dating back to the 16th century, in which the locality now known as the Kimberley diamond mines is indicated thus: Here be diamonds! Just as accurately have these old Portuguese geographers indicated the gold bearing regions of South Eastern Africa, which are regarded as the discoveries of modern enterprise, and the fact is apparent that Portuguese exploration in Africa was of a much wider character than is generally known, and must to a great extent have guided the work of modern explorers.

For the past two centuries gold has been obtained from the natives on the East Coast in barter for the wares of civilization which they have learned to know a need of. Sofala and the countries which lie beyond are on the authority of trustworthy writers assumed to be the Ophir of the Bible, the region over which the Queen of Sheba wielded her sceptre, and from whence Solomon obtained the supplies of gold which added significantly to the splendor of his reign. The testimony of the old Portuguese writers is all in favor of this evidence, and added to this Josephus and the Koran can be quoted in support of it. In brief, the Portuguese writers compass these facts, that books exist among the inhabitants of this country which prove that Solomon obtained his gold here, that these mines bear traces of having been worked from the earliest ages; at the period of the Portuguese conquest here they were open and working, and the reason of their abandonment of them is not clearly ascertained, but it is surmised that the discovery of the New World influenced it.

In modern times no two men have contributed more valuable geographical and scientific information on the

score of these shadowy regions than Thomas Baines and Carl Mauch, two intrepid travellers and dauntless explorers whose names are familiar to all South Africans. They penetrated into these unknown regions and gave them a definite place in geography, where before they had merely been characterized as imaginary deserts or jungles sacred to the habitation of the lion and the elephant. The scientific observations which these men made have led up to the extensive gold discoveries in South Africa which are now astonishing the world and which in the immense areas of country over which they spread have revealed the old workings which exist, and the remains of ruins of ancient buildings and palaces that proclaim that an advanced state of civilization prevailed which is utterly foreign to the present inhabitants.

The Portuguese had, at the date to which I have alluded, penetrated very far into Central Africa, and the natives on the Congo and the East Coast retain traces of a civilizing influence, and in the degree to which they cultivate, and in the desire which they evince for commercial intercourse they are far in advance of the tribes further south. The natives from Central Africa bring down to the East Coast ports gold, silver, malachite, ivory, indigo, wax, sago, and arrowroot. These industries owe their inception to the early influence of the Portuguese.

The first discoveries of gold in South Africa were made in the northeastern part of the Transvaal, in the district of Lydenburg, and they were of the alluvial order. These fields were worked from 1883 to 1887, and from available statistics it is computed that the amount of gold shipped through the ports of Cape Colony and Natal made a to-

tal value of £680,000, but I may affirm on reliable data that this represents only a small proportion of what was actually found. Diggers betray a close reserve on the subject of their finds, as there is nothing they dread more than a rush on what they regard as their peculiar preserves, and many of them quitted the picturesque solitude of this Lydenburg valley, carrying quietly away the snug little fortune their labors had amassed. As an instance of the simplicity of the mining operations I may state that my sister established herself there; she made the first lady in the community, and lived for some years in a little canvas tent with a younger brother in the mountainous isolation. She possessed a claim, and personally supervised the labor of her natives. Her success was not immediate, but at different times she found gold in small quantities sufficient to pay her expenses and give her encouragement. At the end of two years her success was trumpeted forth from one end of South Africa to another, and she was accounted a great heroine in that some large and valuable nuggets were found in her claim; the largest of these weighed 5 lbs., and it was exhibited at your Centennial exhibition with several other nuggets from her claim and together with about 50 pounds weight of gold found by Mr. Cameron—the whole quantity was exhibited by him. At this time my sister had united her fortunes to his.

The success of these mining operations in the north-eastern part of the Transvaal attracted the notice of the British Government. At this time the republic under the administration of an able and enlightened president, Mr. Burgers, was prosecuting progressive schemes that necessarily were adverse to the interests of the British

Colonies. These Colonies had hitherto monopolized the trade of the interior republics, which is a rich and valuable one, the exports consisting of wool, ivory, feathers, gold and diamonds, besides agricultural produce. Mr. Burgers conceived the idea of a trade which would be independent of British ports, and he entered into a treaty with the Portuguese Government for the construction of a railway from their port on Delagoa Bay, on the East Coast, to the capital of the Transvaal. Delagoa Bay is the finest harbor in South Africa and the gateway to the richest part of that country.

The prospect of this railway communication met with great disfavor from the British Colonies, diverting as it would the trade which constituted their chief prosperity. Forces were set in play with a view to obstruction, and finally resulted in the annexation of the Transvaal by the British Government in 1877. The justification for depriving the Boers of the independence guaranteed them in the charter of 1852 was set forth in a list of flimsy pretexts which were without one jot or tittle of truth. The Boers, it was argued, could not govern themselves, their native policy endangered the British Colonies.

The Boer Government, which embodies the principles of republicanism, offered securities and privileges amply illustrated in the fact that a considerable number of British subjects had settled under it, and with regard to their government and dealing with the natives, as compared with other records, it is exemplary; the proof of this finds expression in the fact, that they, a handful of Boer settlers, have lived in a very network of the most powerful of the South African native tribes on terms of

peace for over half a century. As contrasted with this the English have waged a succession of bloody and devastating wars which have attached an aspect of terror and savagery to South Africa that has greatly retarded an extended colonization of its shores. To summarize briefly the events which preceded the annexation of the Transvaal I will quote a short passage from a work of my own, "The Alien Transvaal," which illustrates the argument I have sustained. This work has been favorably commented on by the English press, as recording impartially the occurrences of the time.

"When Mr. Burgers was made President in 1872 of the Transvaal he tried to preach to the Boers that their safety lay in their aiding the development of their country's resources, thus increasing their revenues and establishing a strong government which would be its own security against the intrusive interference of other nations. Rewards were offered by Government for the discovery of payable gold fields, and this led to the opening up of Pilgrims' Rest in 1873. It lies about sixty miles to the northeast of Lydenburg. The success of a few diggers had the effect of creating some excitement in this direction and in less than two years a flourishing little township numbering a population of four to eight hundred souls had grown up in the picturesque isolation of the mountains. Stores were established, law agents prospered, a bank, temporary places of worship, a newspaper, all found new pastures for their extended efforts.

"The population at the gold fields consisted altogether of English people, and to meet this difficulty the Government had generously nominated their magistrate and

officials from their own countrymen. They were also granted the privilege of electing two members to represent them in the Volksraad, and indeed they were little less than constituted an independent little English Colony in a Dutch republic; but the very freedom and independence granted them, made them, instead of contented, ambitious and unmanageable. They promulgated a strong advocacy for British rule, even going so far as to ask England to take them under its protecting ægis, and while the republic was plunged in the distractions of a Kafir war, which there is very little doubt was incited by the element which desired its ruin, they abused the confidence the Government had placed in them by defying all authority and assuming an open disregard for all law."

President Burgers found himself harassed and beset on all sides, his schemes for the progress of the country obstructed by this petty but expensive warfare, and a plotting spirit of mischief at work among the English community, on whose intelligence he had relied for support in his schemes for the advancement of the country. At this juncture the British Commissioner stepped in, fresh from Downing Street, with instructions to annex the country. The Boers were not in a position financially or otherwise to take action against this fresh foe, and President Burgers counselled them strongly against attempting an armed resistance; he advised them rather to wait the result of an appeal to England's justice and to organize a deputation to represent that appeal. Mr. Burgers retired to poverty and obscurity utterly broken down by the ruin which had overtaken him, and he died broken-hearted. The Boers had so much faith in

the counsel he gave them, that they sent three successive deputations to England; these in turn urgently protested against the British Government retaining possession of the country, and argued that the facts of the case as represented, no longer gave them a justifiable excuse for doing so.

In the meantime the people of the country adopted an attitude of passive resistance, they refused to pay any taxes or in any way to acknowledge the alien government. In this manner two years passed away, when a change came over the attitude of both parties, the Boers, convinced that mere appeal to England was useless, had determined to take up arms to vindicate their rights, the British Government were becoming dissatisfied that no profits were forthcoming from their new investment. They established a military despotism over the Boers, and when the first attempt was made to enforce the payment of taxes by sending troops to seize on personal property, the first shots were fired which opened the Boer war. The Boers proved themselves organized and brave, and the disciplined and picked troops of the British Government sustained defeat after defeat at their hands, until a very panic seized them in the face of the Boer marksmen, whose deadly aim never failed of effect; the English officers were picked off almost at one fell swoop, their distinctive dress making them conspicuous targets.

The bravery of the Boers and the success which attended their arms attracted considerable attention to their cause, and universal sympathy was expressed for them by the nations of Europe.

The final act in this cruel struggle came when the

English were driven from a strong position they had taken up on the Majuba mountain, the general commanding the forces slain and his officers all taken prisoners by the Boers.

Mr. Gladstone at this time, 1880–1881, was at the head of the English Government. He realized that the action of the Boers was no mere discontent set on foot by agitators, but a widespread and deep-rooted antagonism to England's rule. He magnanimously admitted that that rule had been established through the misrepresentation of English agents, and acting on these convictions, he lost no time in performing an act of tardy justice. Majuba was succeeded by the negotiation of peace proposals, which resulted in the Transvaal being restored by England to the Boers. Once more their muskets were laid by, and they fell back to their contented pastoral lives. The English have attributed many ignoble characteristics to the Boers. I cannot give you a better idea of them than by quoting their action at one or two critical periods, which I think often gives the test of nations as well as of individuals. In 1879, when the English Government were at war with the Zulus, it would have been easy for the Boers to have allied themselves with the Zulus or to have taken up arms independently and ousted the British from the Transvaal, but they took no unfair opportunities. During the Boer war there was not an act of spoliation committed or a home desecrated, though thousands of English were at the mercy of the Boers. Pretoria, the capital of the Transvaal, was entirely evacuated, the inhabitants having been ordered by the British administrator to take up their residence in the fort as a besieged

people. The Boers might have burned or pillaged the homes of these British residents, but not in one instance was an act of this nature committed. The moderation they exercised, the freedom from lawlessness and license which marked their action from the extreme north to Lang's Nek finds in history no parallel. They sought no petty individual revenge, but insisted upon their rights in a spirit of greatness that is worthy of the highest admiration. Distinguishing between might and right, England's short-sighted policy in South Africa has lost her prestige, possession, and will drain from her a large proportion of a magnificent commerce of which she might have had the entire control.

A general depression succeeded the subsidence of these two wars, the Zulu, and the Boer, which followed rapidly one on the other. They brought a glut of money into the country which was recklessly squandered. The influence which these wars exercised was to divert men from industrial pursuits and to pander to the depraved desire to amass wealth through any speculation, however illegitimate. The withdrawal of this species of excitement turned the attention of men's minds to other resources, and once more the reputed mineral riches of the East absorbed attention. A spirit of active prospecting was carried on northward from the old diggings at Pilgrims' Rest, and the de Kaap valley, which lies in a network of mountains, many of which are volcanic in origin, was the centre to which attraction converged. The attention of prospectors was directed to the search for alluvial gold, and only due to the fact that this—occurring only in patchy deposits—gave a very uncertain outlook to the establish-

ment of any permanent working, was notice bestowed upon the prospect of securing better results from the quartz reefs, in which the indications of gold had been pronounced by Mauch and Baines to give promise of great richness.

An immense amount of laborious work resulted in practical experiments, but the outcome gave generally encouragement. The discovery of a literal mountain of quartz which proved of extraordinary richness and which has been named "Sheba," laid the foundations which are now turning South Africa into one vast field of mining enterprise. Several hundred-weights of the quartz from the Sheba mine were sent to Messrs. Matthey, Johnson & Co. of London, and as the results of assays to which they subjected it, it yielded variously 47 oz., 20 oz. and 13 oz. to the ton. A positive craze seized upon South Africans, and the populations of whole towns set out for El Dorado.

The production of gold from the Sheba mine gives a monthly record of £50,000. Its capital is £680,000. Two hundred companies were soon floated on mines in the district of the Sheba. None of these have proved of equal richness to it, but the principal disadvantage which they have had to contend against has been bad management. Men have been appointed to the management of mines through the interest of promoters or directors who had not the most elementary knowledge of the science of mining.

As a profession, the future offers a great opening for the science of mining, and practical people are urging that schools for the study of mineralogy and the domestic economy of mining should be established. Barber-

ton was the first of about a dozen towns in South Africa which have sprung into existence through the development of mining enterprise; it is situated on the slope of the de Kaap valley, in the north of the district of Lydenburg, a network of mountains varying in altitude from 3,000 to 8,000 feet above the level of the sea encircles it, and it lies stretched beneath one long continuation of gently undulating plain 20 miles long and 17 miles in breadth. It had long an uncanny reputation, and was known by the Boers as the valley of the shadow of death, and a kind of superstitious dread prevailed with regard to it. It has outlived this reputation, and its township has proved as healthy a place of residence as any in South Africa. The scenery in its vicinity is unrivalled for its grand and imposing character. It carries a lofty impressiveness with it that stirs the mind with an overpowering and reverential awe, and one seems to inhale deep draughts of a subdued delight, to stand, as it were, in the Holy of Holies, wherein to bring the thoughts of every day were profane. It seems as though here were a great unfelt presence, and in it we are unconsciously truer, nobler, reaching more nearly to the ideal which is the type of humanity, though as we race for the sordid things of earth, we mock it for a poet's fancy. In these grand and untenanted solitudes of nature there is a subtle sympathetic vibration that in its very essence utters a language to man. It is a solemn and a sweet conception, and the material element of humanity seems less potent in the thought that to man alone does nature speak, and to him unfold the great mysteries that are enshrouded with a history that excites all his faculties of curiosity and admiration, and

yet answers no word to the revelation he would fain know of their origin.

For a terse and telling description of the de Kaap valley I will quote to you the idea it awoke in the mind of one writer. He says: "Twenty-six miles from Barberton one can look down upon the whole of the de Kaap valley, a glorious sight at any time. I saw it at sunrise, 4,500 square miles of mountain, hill and valley, suffused with the rosy flush of dawn, a vast jumble of hills looking as though it had been the play-ground of the Titans." But I must leave Barberton, with its mountains of reefs and majestic natural features, and ask you to travel with me 300 miles in a southwesterly direction, and 30 miles south of Pretoria we find ourselves in another district of the Transvaal, where the physical character of the country bears no resemblance to what I have just described. It is an elevated plateau 6,000 feet above the level of the sea, stretching out in one continuation of undulating plains, diversified only by long lines of low hills, looking in the distance like crusty eruptions. This country is characterized as high veldt, that is high land, and had hitherto a value only as summer pasture for cattle. It is now the site of a handsome town, Johannesburg, and of one of the richest and most wonderful gold fields in the world. The town grew with such rapidity, and was built of such a substantial character that it has completely outstripped any of the experiences of California or Australia. In less than two years its population had reached the number of 50,000, and newer towns were laid out on its outskirts.

The character and magnitude of its mining enterprise are marvellous, five or six hundred mines are in the hands

respectively of companies. The aggregate production of gold in 1888, attended with all the difficulties of early development, was valued at £1,000,000 sterling. The shipments of gold are now averaging 30,000 ounces per month, but a vast increase of power is being added to the batteries, and this it is calculated will increase the production to three or four times this amount. The output of gold for the month of July, 36,000 ounces, was on exhibition at the Paris International Show. Vast shipments of gold mining machinery are imported to Africa from this country and Messrs. Fraser & Chalmers of Chicago are getting to be household words out there. The occurrence of gold at Johannesburg has excited considerable geological speculation, and its existence there is regarded as of a singular character. The reefs are not of the quartz formation as at Barberton, neither are they of the same difficult nature to deal with; they are a composition of pebbles, water-worn stones and quartz, forming a conglomerate which is cemented together by sand, and on exposure to air it crumbles to gravel; the gold is easily disintegrated. The Boers named the composition "bauket" on account of its resemblance to a sweetmeat which is somewhat in appearance like the almond rock, and the illustration is very apt.

Scientific theory assumes that the tract of country in which this gold formation exists, was in ancient times a sea beach, the gold was deposited in fine grains from the sea water, each layer being parted by a division of sand, in the ages which ensued the strata became consolidated and a mighty upheaval took place, tilting up the whole sea beach, so that the strata formerly lying in a

horizontal manner are now found perpendicular, extending downwards to depths not yet gauged. The evidence of the volcanic fire is patent in the conglomerate mixture.

There is practically no limit to the dimensions mining operations may assume in South Africa. There are yet illimitable stretches of country open to exploration in which the indications point to an inexhaustible supply of the precious metal, while silver, copper, lead, iron and coal bestrew the country. The coal formation is probably greater than exists in any part of the world. Geologists speak of the distribution of mineral wealth in South Africa as eccentric, because it occurs in unexpected places and under novel conditions. Mr. Penning, a geologist of some eminence, who has devoted many years to scientific observations in South Africa, believes that very large beds of gold will be found; he assumes this from a theory which his experiences have led him to formulate, but its truth remains for actual demonstration. As I have stated, the first discoveries of gold were made in the eastern division of the Transvaal; 300 miles southwest of this occurs the gold formation, which makes Johannesburg; 70 miles south of this a continuation of this formation is found extending beyond the Vaal River, and it is now practically demonstrated that a great belt of gold-bearing country stretches across the Continent from Delagoa Bay on the east, to Walfisch Bay on the west. The development of so vast a mining industry in South Africa has contributed to the prosperity of every section of the country; a capital of £20,000,000 is now invested in mining in the Transvaal, a fact which gives it a position of foremost impor-

tance. With a large surplus revenue in its coffers it is prosecuting public works that will soon bring it into closer contact with the outer civilized world. The first section of the railway from Delagoa Bay is completed, and though British interests have brought a force of influences towards obstructing it, the tide of circumstances is too powerful in its favor, and it will draw the bulk of the trade from the republics. All religious denominations have free scope in the Transvaal, and educational advantages will enter into all the lives of the Boers of the rising generation. Government schools are established in all the towns; the Volksraad recently voted £20,000 for the purpose of erecting a college; £100 a year is granted by Government to any English private school in which Dutch is included in the curriculum, and this interchange of language is making its influence felt towards removing the intolerance and prejudice with which English and Boers regard one another. Looking back a few years at the Boers, living in their isolated and pastoral simplicity, cut off from all advantages of education and civilization, it seems almost impossible to realize the rapidity with which changes come about, and that a few years more will rank them in the confraternity of nations. In this lies the fruition of the hope which animated the early pioneers of 1688, whose spirit has filtered through the successive generations, leading them to endure untold suffering in preference to the sacrifice of their inborn independence. The reflection is not without a lesson, and it embodies the principle of a great purpose being the ultimate destiny of humanity.

Mr. Kruger is serving his second term of office as

president since the restoration of the Transvaal to the Boers. He is pure and simple a son of the soil, his parents being of the pioneers who abandoned the Cape Colony in 1835. He is a man of few educational advantages, as we understand them, but circumstances have bred in him a strong capacity for government. He has been compared in character to the old Scotch Covenanters who went about with the Bible in one hand and the sword in the other. He is a man of severely religious principles and is one of a sect called Doppers, a strict body of Dutch Protestants, peculiar in dress, manners and way of living; they correspond to the Puritans. Among the Boers, whose entire confidence he possesses, Mr. Kruger is known as "Oom Paul," Uncle Paul. At the time of the British occupation of the Transvaal he made two journeys to England to induce that government to undo the act of annexation, and he was the central figure in the Boer war and in the conduct of the peace negotiations.

He is regarded by outsiders as a man of strict integrity and strong common sense, and he has shown peculiar ability by the way he has adapted his rule to newer conditions; he has suddenly been called upon to regulate the affairs of an alien population of adverse sympathies and ambitions, 50,000 English who have flocked into the Transvaal owing to the recent discoveries of gold. He has displayed a peculiar tact in identifying his government with their interests, but he shows a firm disposition to resist the spirit that worked to the overthrow of his predecessor, President Burgers, though at times it does not leave him without anxiety.

The native tribes of South Africa are numerous.

Their government is chiefly of the patriarchal order. The stringency of their laws is a necessity, death is the punishment for infringement of these—for which their state can provide no prisons.

The morality of natives and the peaceful relations of domestic life find no parallel in civilization. Some of their customs are analogous to the Jewish, and coming to a later date others are not unlike what were common among the ancient Highland clans, and their superstitions, beliefs and practices in witchcraft are like those current in England in the time of James I.

The savagery of the natives is served up to excite our horror, and yet the refined cruelties of civilization would seek in vain for a counterpart amongst them. Human nature is the same in every condition and the brutal element is no less apparent in the state called civilization as contrasted with barbarism. The general disposition of the natives is peaceable. A simple diet and constant out-door life give them a vigor of frame and an exuberance of animal spirit that constitutes a great measure of happiness. Their reputed savagery consists to a great extent of the defense of their rights, which in the presence of Europeans they dread are assailed.

Their future opens a wide field for genuine philanthropy, and the first inception of civilization should be based on an industrial system. The less of the shadowy and vague they are taught the better, its tendency is to demoralize them, for like children, and men too, they are more susceptible to example than precept.

DEFINITIONS OF GEOGRAPHICAL NAMES WITH INSTRUCTIONS FOR CORRECT PRONUNCIATION, FOR THE VARIOUS HIGHER SCHOOLS.

A SUPPLEMENT TO EVERY SCHOOL GEOGRAPHY.

BY

KONRAD GANZENMÜLLER, Ph. D.

In the *foreign geographical names*

a sounds	always	like	a in father	=ā (a long), or	
		"	a in fat	=á, ă (a short);	
e "	nearly always	"	a in fate	=ē,	or
		"	e in met	=é, ĕ;	
i "	always	"	i in marine	=ī,	or
		"	i in pin	=í, ĭ:	
o "	"	"	o in note	=ō,	or
		"	o in not	=ó, ŏ;	
u "	nearly always	"	oo in room	=ū,	or
		"	u in bullet	=ú, ŭ.	

¯=vowel long; ′=vowel short, but accented; ˘=vowel not accented.

ā=Montāna	Santiāgo	(Bāden)	Strāssburg
á=Chárleston	Carácas	Hártford	Hálle
ē=(Maryland)	Montevidēo	Hastings	Brēmen
é=Fredericksburg	Cayénne	Shéffield	Bréslau
ī=(Greendale)	Līma	(Leeds)	Berlīn
í=Míddletown	Quíto	Brístol	Línz
ō=Dakōta	Bōgotā	Hōlywell	Rōme
ó=Róckford	Orinóco	* London	Bónn
ū=(Liverpool)	Angostūra	(Siracūsa)	Jūra
ú=Lake Sŭperior	Acapúlco	(Cúxhafen)	Ulm.

* rather *Lúndun.*

GREEK ALPHABET.—LATIN CHARACTERS,

α	*β*	*γ*	*δ*	*ε*	*ζ*	*η*	*ϑ*	*ι*	*κ*	*λ*	*μ*	*ν*	*ξ*	*ο*	*π*	*ρ*	*σ-ς*	*τ*	*υ*	*φ*	*χ*	*ψ*	*ω*
a	b	g	d	é	z	ē	th	i	k	l	m	n	x	ó	p	r	s-s	t	y	ph	ch	ps	ō

Α Β Γ Δ Ε Ζ Η Θ Ι Κ Λ Μ Ν Ξ Ο Π Ρ Σ Τ Υ Φ Χ Ψ Ω
A B G D E Z E Th I K L M N X O P R S T Y Ph Ch Ps O

The Latin vowels a, e, i, o and u have always the sound as given above (long or short).

The *Greek* α and ι, = the Latin a and i; — η = ē, ε = é, ω = ō, ο = ó; — ου = ū; — υ, y = i in marine, j = y consonant.

αι, ae; ει, ei = i in pine; αυ, au = ou in house; ευ, eu = oy in buoyance.

γ, g, Γ, G sounds like g in girl; ϑ θ = th in thin; ξ, x, Ξ, X = x in axe; φ, Φ = ph in phenomenon; — χ, Χ, ch, Ch has not a corresponding sound in English; it sounds as *a strongly aspirated h = ch.*

The Greek γγ = ng, γκ = nk.

ʹ = sharp sound; ˋ = sharp sound, but muffled; ˉ = long sound; ʿ = h (ἡμι = hemi); ᾽ is mute (or inaudible).

῾Αγιος (holy), νῆσος (island), μέγας (great); τρία (three) ζώνη (girdle), πόντος (sea); — βοῦς (ox), πύλη (gate).

Σφαῖρα (sphere), ἤπειρος (continent.; ναῦς (ship), εὔξεινος (hospitable).

Γῆ (earth), ϑερμός (warm), αἶξ (goat), κεφαλή (head); — χαλκός (copper, metal).

Στρογγύλος (round), ἄγκων (elbow).

Geographical names are easily impressed on the memory, if their meaning is known; not all of them, but a great many, can be explained.

The word *geography* is derived from the Greek language; the Greek γῆ meaning the *earth*, and γραφειν = *to describe;* hence GEOGRAPHY = DESCRIPTION OF THE EARTH.

The Greek σφαῖρα (Latin *sphaera*) means a *ball, sphere*, and ἡμι *half.* From these we have the word HEMISPHERE for HALF THE GLOBE and we speak of the

eastern and the *western*, the *northern*, and the *southern hemispheres.*

From the Latin *globus*, a *globe*, and *planus*, *flat*, or plain, is formed the compound PLANIGLOBE, which is applied by some to a representation of the *hemisphere on a flat surface.*

In most ancient times the nations discriminated two halves of the earth;—the Assyrian *assū* means *sun-rising*, and ASIA=LAND OF THE SUN-RISING, or *land of the east*, the *Orient*;—the Phœnician *ereb*=(darkness or) *sun-set*; from this is derived EUROPE=LAND OF THE SUN-SET, or *land of the west*, the *Occident.*

EUROPE.

BALKAN PENINSULA.

GREEK: πόντος (Latin pontus) = *sea*, πόρος=*ford*, νῆσος=*island*, χερσόνησος (chersonēsus)=*peninsula*, ἤπειρος =*continent*, ἰσθμός=(throat), *isthmus*, ὄρος=*mount*, ποταμός=*river*, πόλις=*city*, πύλη (and pl. πύλαι)=*gate, door*; Ἑρμῆς=*god Mercury*, Ἄρτεμις=*the goddess Diana*;—ὁ κύων (gen. τοῦ κυνός)=*dog*, βοῦς (gen. βοός)=*ox, cow*, αἴξ (gen. αἰγός)=*goat*;—χαλκός=*copper* (metal);—κεφαλή (pl. κεφαλαί)=*head*, κύκλος (cyclus)=*circle*, (environs); νίκη=*victory.*

μέγας (fem. μεγάλη, neut. μέγα)=*great*, θερμός=*warm*, ἄξεινος=*inhospitable*, εὔξεινος=*hospitable*, ἅγιος=*holy, sacred*;—ἡ=*the* (fem. sing.), αἱ=*the* (fem. pl.); τρία=*three*;—πρό=before, *in front.*

The ancient name of the Black Sea Πόντος Ἄξεινος, =*the inhospitable sea*, was changed, after many Greek colonies had been founded on its coasts, into Πόντος

Εὔξεινος, Latin PONTUS EUXINUS=THE HOSPITABLE SEA; —BOSPORUS="OXFORD," or *cow-ford*, so called because the fabulous Io was said to have crossed it as a cow;—PROPONTIS, named from its position *in* FRONT of the *Black Sea*, as well as of the *Ægean*;—HELLESPONT=SEA OF HELLE, because here, according to tradition, Helle fell into the water and was drowned;—KYKLADES (the Latin *Cyclades*)=ISLANDS OF THE CIRCLE, so named because they encompass the "holy island of Delos;" —THE THRACIAN CHERSONESUS=THE THRACIAN PENINSULA, so called in distinction from the *Cimmerian Chersonesus*, or the modern peninsula of the Crimea; PELOPONNESUS=THE ISLAND (*or peninsula*) OF PELOPS, who landed there from Asia.

EPIRUS=THE CONTINENT, as opposed to the neighboring Ionian Islands; CAPE ARTEMISIUM=CAPE (*with a temple*) OF THE GODDESS DIANA;—*Mount Athos* was called the HAGION OROS or SACRED MOUNTAIN;—KYNOSKEPHALAI (Latin *Cynoscephalæ*)=DOG'S HEADS (two ranges of hills having this appearance); Battle, 197 B. C.;—THERMOPYLÆ=THE GATE OF THE WARM SPRINGS;—AIGOSPOTAMOS=GOAT RIVER;—ISTHMUS *of Corinth* (ISTHMUS, in English).

CONSTANTINOPLE=CITY OF CONSTANTINE (the Great), who made it his capital, A. D. 330;—ADRIANOPLE=CITY OF HADRIAN, Roman Emperor, 117 to 138 A. D.; —PHILIPPOPOLIS=CITY OF PHILIP; it was founded by Philip I. of Macedon, who reigned from 359 to 336 B. C.;—NICOPOLI (in Bulgaria)=CITY OF VICTORY;—MEGALOPOLIS (ἡ μεγάλη πόλις)=THE GREAT CITY;—HERMOPOLIS (on the Island of Syra)=CITY OF HERMES;—TRIPOLIZZA=THREE CITIES, so called from its being colonized

by inhabitants of three cities;—PYLOS=THE DOOR, or *entrance*, a considerable port of the Peloponnesus;—CHALCIS=CITY OF COPPER, *or city of ore*;—The inhabitants of this city, which was on the Island of Euboea, founded colonies in Thrace, and these were called *Chalcidian* cities (*αἱ Χαλκιδικαὶ πόλεις*). From these cities the peninsula CHALKIDIKE (Latin *Chalcidice*) took its name.

From the word *λευκος*, which means *white*, was derived the name of the *Island of Leuca*=WHITE STONE, so called from the lime-stone rocks on its coasts; from this word is also derived the name of LEUCTRA=THE WHITE CITY;—*μέτωπον*=FOREHEAD, *front*; hence CAPE MATAPAN, the *most southerly headland* of Greece;—*λάμπειν*=*to shine*. From this verb is taken the name of OLYMPUS =THE SHINING MOUNTAIN, its summit being covered during a great part of the year with snow;—*ἀκτή*=*a steep coast*, and hence ATTICA, formerly *Ἀκτική*=COASTLAND;—*μάντις*=*seer*, prophet; *μαντεῖον*=*oracle*, and MANTINEA=PLACE OF ORACLE; *παρθένος*=*virgin*; THE PARTHENON (in Athens)=*the house, or* THE TEMPLE, OF THE VIRGIN GODDESS ATHENE;—*κυπαρίσσος*=*cypress*; CYPERISSIA=PLACE OF CYPRESSES; hence *Gulf of Cyperissia* (also named Gulf of Arcadia);—*ὄλυνθος*=*fig*; OLYNTHUS=*the place, or* CITY, OF FIGS;—*ναῦς*=*ship*; NAUPLIA=PLACE OF SHIPS;—*ναυπηγεῖν*=*to build ships*; and NAUPACTUS, now in an Italian corruption *Lepanto*, means A PLACE OF SHIP-BUILDING or *a dockyard*;—*ἄκρος*=the highest; and ACROPOLIS was *the citadel*, THE HIGHEST POINT *of the fortified city*;—*πλατύς* means *broad*, or *flat*; and PLATAEA, therefore, is equivalent, to "THE BROAD FIELD;" —**σπείρειν*=to sow, or *to scatter*; from this verb is de-

*These are now held to be uncertain.

rived the name of SPARTA=THE SCATTERED CITY, consisting of four or five open places.—The SPORADES, or SCATTERED ISLANDS, have the same derivation.

Doubt is now thrown on the derivation of the word *Salamis* from the Phœnician *salam*, peace.

CAPE KOLONNAES (formerly *Cape Sunium*)—CAPE OF PILLARS; on the highest point of this headland thirteen pillars of the ancient temple of Athene are to be seen; —MEGALOKASTRO=THE GREAT CASTLE (on the Island of Candia).

LATIN: *terra=earth, land*, and *medius=middle;* from these is formed the name of the MEDITERRANEAN SEA, from being, as it were, IN THE MIDDLE OF THE LAND;—*marmor=marble;* MARMORA is an island famous for its MARBLE *quarries;* hence *Sea of Marmora;*—from *palatium*, a *royal* RESIDENCE, or castle, comes the name of SPALATO, in Dalmatia.

ITALIAN: *mónte=mountain; negro=black; sánto=holy*, sacred.

Mount Athos (the Greek *Hagion Oros*) is also named MONTE SANTO=THE HOLY MOUNTAIN, or *sacred mountain;*—MONTENEGRO=THE BLACK MOUNTAIN ("Black" here means rocky, or sterile).

SLAVIC: *gora=mount;—grad=castle;—belny=white;—tscherny=black.*

The principality of *Montenegro* is called by the Slaves TSCHERNAGORA, or THE BLACK MOUNTAIN;—BELGRADE=THE WHITE CASTLE.

TURKISH: *bālkan=mountains, dagh=mountains;—pu=river;—serāy=palace, residence;—kāra=black.*

BALKAN=MOUNTAINS; and the *Balkan Peninsula* is, therefore, *the mountainous peninsula;*—KARADAGH=

THE BLACK MOUNTAINS ("Black" meaning sterile);—KARAPU=THE BLACK RIVER.

The palace, or *residence of the Sultan* in Constantinople takes the name of *Seray*, or *Serail.* Near the spring of the river of Bosna the Turks founded BOSNA SERAY=THE BOSNIAN RESIDENCE, now in a Slavic form *Serajewo.*

RUMILI (*Roumelia*) means *the* COUNTRY OF THE MEN OF RUM (so the Turks called the Greeks living in those parts); *Roumuni* (Rumanians)=*Romans*, whose tongue is very like Latin;—RUMANIA=COUNTRY OF THE ROMANS;—SALONICA is an abbreviation of THESSALONICA, the name given to the place by Cassander in honor of his wife, sister of Alexander the Great.

**Accentuation:* Zácyntho, Rhódopē Mountains, Táygetus, Herzegōvina, Gálata, Jánina, Patrás, Scútari.

ITALY.

In the *Italian geographical names* the *vowels a, e, i, o,* and *u* have always the sounds, as given on page 516.

The *consonants* sound much as in English, but **c* before a, o and u is to be sounded like k;—** if c is to have the sound of k before e and i, an h (which is mute) must be inserted; che=ke; chi=ki.

†*c* sounds before e and i like ch in charm;—†† if c is to have the sound of ch before a, o and u, an i is to be inserted; cia=cha, cio=cho, ciu=chu.

It is the same with the letter g; g like g in girl, or like j in John.—Therefore:

k: ca, che, chi, co, cu,; *ch:* cia, ce, ci, cio, ciu.

g: ga, ghe, ghi, go, gu; *j:* gia, ge, gi, gio, giu.

gl is pronounced like li in pavilion, and ng like ni in union; sc—sh, zz—ts.

Now, the *following*, like *other Italian geographical names, will be easily pronounced with correctness:*

Carrāra, Málta, Spolēto, Palérmo; Torīno, Bríndisi; Ancōna, Campo Fórmio; Siracūsa, Abrúzzo.

Cremōna, Cāpri, Ischĭă, Cōmo, Custózza;—Vercélli, Cívita Vécchia, Ajáccio.

Gran Sásso, Mónte Gárgano, Lāgo di Cōmo, Gúăstálla;—Perūgia, Ādige, Lāgo Maggiŏre.

Cágliari; Legnāno; Scirócco (the hot wind); Abrúzzo.

ITALIAN: *ísola=island, rivièra=coast, monte=mountain, lāgo=lake, canāle=canal, città*, or *cívita=city, villa=village; sásso=rock, vénto=wind; chiāve=key; levánte=east, ponénte=west; gran, gránde=great, maggiŏre=greater, rotóndo=round, vécchio* (fem. vécchia)=*old, nŭōvo=new, franco=free, bello=beautiful;—spartīre=to divide;—di=of* (gen.).

ISOLA BELLA=THE BEAUTIFUL ISLAND (lying in the Lago Maggiore);—CAPE SPARTIVENTO=THE WIND DIVIDING CAPE;—MONTE ROTONDO (on the Island of Corsica)=THE ROUND MOUNTAIN;—MONTE NUOVO=THE NEW MOUNTAIN (it is formed of ejected masses, which were thrown up at the time of the eruption of Vesuvius, in 1538 A. D.);—GRAN SASSO (D'ITALIA)=THE GREAT ROCK (OF ITALY), the highest pinnacle in the Abruzzo;—LAGO MAGGIORE=THE GREATER LAKE;—LAGO DI COMO=LAKE (*of the city*) OF COMO;—CANALE GRANDE (in Venice)=THE GRAND CANAL.

RIVIERA DI LEVANTE=THE EASTERN COAST;—RIVIERA DI PONENTE=THE WESTERN COAST (the coast on the Gulf of Genoa).

CIVITA VECCHIA=THE OLD CITY;—VILLAFRANCA=THE FREE VILLAGE, lying southward of Verona (cessation of arms on the 11th of July, 1859, A. D.);—CHIAVENNA=KEY-CASTLE (it commands the highway over the pass of Splugen).

GREEK: ὅρμος=*harbor*, port; πόλις=*city;* ἄγκων=elbow, *angle;* ξάγκλη=*sickle*, δρέπανα=*sickle;*—νέος (fem. νέα)=*new*, ἄκρος=*pointed*, στρογγύλος (fem. στρογγύλη)=*round*, λίπαρος=fat; πᾶς (fem. πᾶσα, neut. πᾶν)=*all;* τρία=three.

SICILY was formerly named TRINAKRIA=THE THREE-POINTED *island* (from its form);—*Strongyle*, now STROMBOLI=THE ROUND *island* (it consists of a single conical mountain);—LIPARI ISLANDS=THE FAT ISLANDS (so called because the ancient inhabitants sold large quantities of alum and sulphuric salts).

Panormus, now PALERMO=(*all-harbor*), CONVENIENT HARBOR (so named from the wide gulf there);—ZANKLE=CITY OF SICKLE (the harbor is surrounded by a sickle-shaped neck of land); after the immigration of the *Messenians* from the Peloponnesus the ancient name of this city was changed into *Messana*, now *Messina;*—*Drepanum*, now TRÁPANI=CITY OF SICKLE (so called from the face of the peninsula, on which it is situated);—*Neapolis*, now NAPLES (the Italian *Napoli*)=THE NEW CITY;—ANCONA=(*elbow*), ANGLE (from its position in an angle of the coast; Greeks from Syracuse settled in this place, in 380 B. C.).

φλέγρειν=to burn, φλεγραῖα=PLACE OF BURNING; hence the PHLEGRÆAN FIELDS, west of Naples, with extinguished volcanoes and hot sulphur-springs.

LATIN: *mons*=mountain, *montium* (gen. pl)=*of the mountains;*—*campus=plain*, *flos* (pl. flores)=*flower*—

pes=foot, pede (abl.)=*on the foot, ostium*=(gate), *mouth;—evéntus=event;—bene=well,—male=badly;—placēre=to please;—cis=on this side.*

CAMPANIA=THE PLAIN COUNTRY; *Pedemontium*, now PIEDMONT=(*the country*) AT THE FOOT OF THE MOUNTAINS, —*Northern Italy* received from the Romans the name of GALLIA CISALPINA, or GALLIA ON THIS SIDE OF THE ALPS (it was inhabited by Gauls).

OSTIA=CITY AT THE MOUTH (so called from its former position at the mouth of the Tiber);—*Florentia*, now FLORENCE=CITY OF FLOWERS;—*Beneventum*, now BENEVENTO=GOOD EVENT (the original name of *Maleventum*, or *bad event*, was changed into *Beneventum* after the victory of the Romans over Pyrrhus, King of Epirus, in 275 B. C.);—*Placentia*, now PIACENZA=PLACE, *or city* OF PLEASURE (so called from its delightful situation).

EMILIA takes its name from the *via* ÆMILIA, the high-way built by the Roman Censor Æmilius Lepidus, in 186 B. C.

AUGUSTA: Many cities were named in honor of the Emperor Augustus;—*Augusta Prætoria*, now AOSTA, or AUGUSTA *of the Pretorians*, the imperial life-guard, was founded as a colony of veterans, in 25 B. C.—*Augusta Taurinorum*, now TURIN=*Augusta in the country of the* TAURINI.

CELTIC: *pen=mountain;* hence THE APENNINES= THE MOUNTAINS.

Etruria took its name from the ETRUSCANS, and is now known as TUSCANY—LOMBARDY=THE COUNTRY OF THE LOMBARDS, who conquered Upper Italy, in 568 A. D.—ALESSANDRIA, founded A. D. 1170, was named in honor of *Pope* ALEXANDER III. (*To be continued.*)

PROBLEM

OF INTEROCEANIC COMMUNICATION BY WAY OF THE AMERICAN ISTHMUS, BEFORE THE AMERICAN GEOGRAPHICAL SOCIETY.

NEW YORK, OCTOBER 20TH, 1889.

MR. PRESIDENT:—No contradiction having been offered to my communication under the above title, that this learned Society kindly permitted to be inserted in their BULLETIN for December of last year, I will leave the question to stand on its own merits.

Meanwhile I beg to be allowed, in the interest of science, to present some of the records of historical facts which led me to bring to light, if not a new, at least a long forgotten and most important feature in the geographical and geological knowledge of our continent; I mean the former existence of a free communication of both oceans through a natural separation between the Panamá cordillera to the North, and the Occidental range of the Andes to the South; the place where lies the *unique* available *passage* for a *tide-level canal* across the American Isthmus.

It was known, as every one conversant with the matter is aware, by the name of "the secret of the strait," which very appellation implies that it was acknowledged to exist, not so deeply hidden, however, that through proper and diligent search, it could not be unveiled. In fact, its existence was hinted at, centuries

before the discovery of America by Christopher Columbus; that is to say, as far back as the traditions of ancient Egypt and Greece, referring to those two far away *immense* islands spoken of in the Dialogues of Plato.

It was indicated by the generic names of "Northern Darien, great river of Darien and Southern Darien," given in the oldest MS. Spanish maps to the present "Gulf of Uraba, river Tuyra and Gulf of San Miguel," respectively.

Its location had been pointed out, as early as 1550, by the great Portuguese navigator, Antonio Galvão, as a round about route from the Atlantic to the Pacific.

It was practically illustrated in the beginning of 1680, by the crossing of above 400 filibusters, in 18 large canoes, under the guidance of the Indians; a fact which I found particularly described in original reports at the Hydrographic Depot of Madrid; repeated in the MS. memoirs of the Rev. F. Jacobo Nalburger, S. J., missionary in that territory from 1741 to 1749; and, I am told, stated also in the History of the Buccaneers printed in London.

Finally, the choice of the Darien has also been recommended in general terms by the illustrious Baron von Humboldt; and most pointedly by the eminent geographer Admiral Fitzroy; so much as to name the rivers "*Paya and Cacarica*," as forming the connection, across a low, narrow tract, between the Tuyra and the Atrato. (P. 185 of Vol. XX of the Royal Geo. Soc.'s Transactions in 1850.)

My confirmatory survey of the ground in 1866 was not therefore presented as a discovery proper, but rather as the unearthing from the dust of the archives

of a secret jealously kept by the former Governments of Spain, for the security of their colonies; and secured by a decree of the penalty of death against any one who deviated in his voyages up or down the Atrato from the straight course of the main stream. This proved an effectual bar to the trader's greed as well as to the explorer's curiosity; till the question was dropped and forgotten during the protracted war of Independence.

Now it may readily be understood how the gradual accumulation of drift mud, sand and rocks, together with big trees, innumerable weeds and every kind of detritus brought down by the frequent freshets of the mighty river, and by the many affluents of the "*American Strait*"—and incessantly driven back towards its Eastern terminus by the impetuous high tides of the Pacific,—have formed that comparatively slight obstruction which separates, at present, the two oceans. The subsequent slow upheaval which, according to the savant Sir Chas. Lyell, has raised the ground all along the Pacific coast of South America, helped by the marvellous vegetation of the Tropics, may well have formed also those irregularly disseminated hillocks or mounds that cover both banks of the river Cacarica at its junction with the lagoons.

Again, to refer to more recent opinions, Rear Admiral Charles Davis, at p. 16 of his report to Congress in 1866, speaking of my communication about my proposed route, and of its intended resurvey by "competent authority," cites Admiral Fitzroy and draws himself the line via Paya in his general map. And finally, Dr. Maak of Harvard University and geologist of the U. S. Exploring Expedition of 1871, officially reports that

evidence exists in the tertiary strata, that the two oceans freely mingled their waters through the present valley of the Tuyra as late as the pliocene period; a learned opinion which is the more to be noted because it shows that the conclusions of science so completely agree with the tradition.

All which tends to confirm the exactness of the data that I have furnished since so many years; and as I hold that science has neither nationality, nor political nor "moneyed" creed, I leave the question open to the judgment of the learned world, and stand by my old device "Magna est veritas, et prævalebit,"—*tardé!*

I am, Mr. President, very respectfully,

ANTHONY DE GOGORZA.

THE RAIYĀN MOERIS.

BY

COPE WHITEHOUSE.

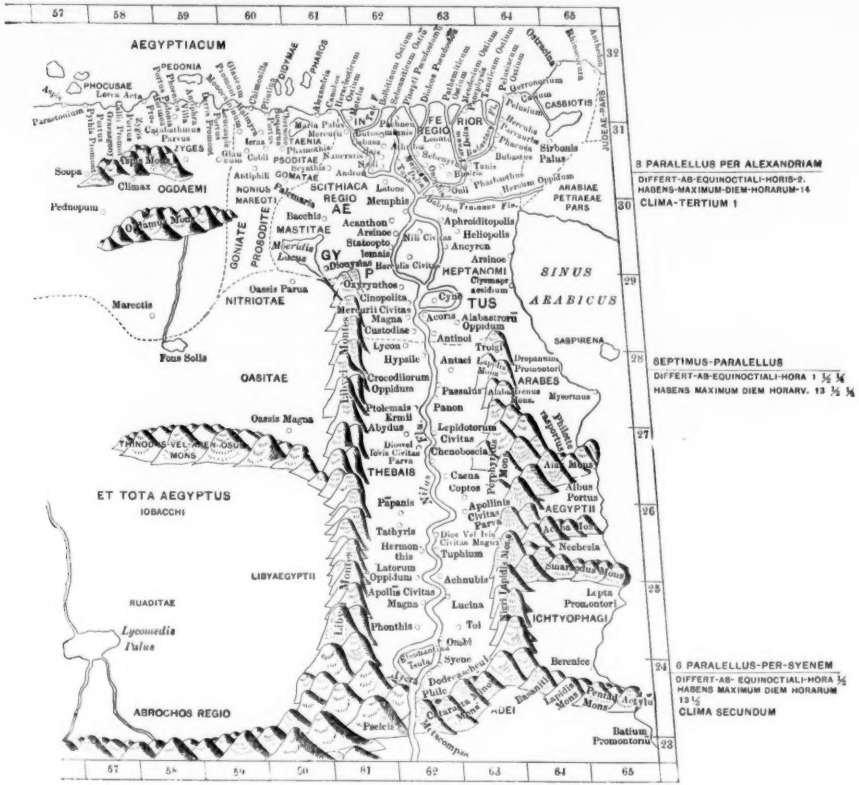
The Journal of this Society (Vol. XIV.) contains, under the title of Lake Moeris, the results of those early explorations in the Fayoum and the adjacent desert which have now assumed a transcendent importance. The claim there made for the great inland sea has been fully justified. The vindication of the integrity and intelligence of the ancient historians is complete. The splendid engineering works of remote antiquity dazzle the eye and stimulate the imagination of statesmen and engineers, who study the arid plains of the Western States or watch the turbulent floods of the Father of Waters.

Diodorus, the Sicilian geographer, thus describes what he saw during his visit to that part of Egypt: "A little south of Memphis a canal was cut for a lake, brought down in length from the city forty miles. Its usefulness was worthy of all admiration and the magnitude of the work incredible. The circuit of the lake is said to be four hundred and fifty miles; and, in many places it is three hundred feet in depth. Who is he, therefore," he exclaims, "that considers the greatness of

NOTE.—This paper contains the substance of an address made before this Society on Nov. 11, 1889. It was illustrated by lantern slides which gave the complete cartography of Middle Egypt, including hieroglyphic, Greek, Arabic and modern maps; as well as by original views of the Bahr Jūsuf, the Fayoum, Raiyān and Muellah depressions, and the adjacent desert.

Drawn from the map in the Ptolemy of 1508.

XIIM


AEGYPTIACUM
PHOCUSAE
PEDONIA
Parsedonium
Scopa
Climax
OGDAEMI
Pednopum
Mons Mareotis
Marcotis
Fons Solis
GONIATE
PROSOPITE
MASTITAE
Meridies Lacus
NITRIOTAE
Oasis Parva
OASITAE
Oasis Magna
TRIMOLOS-VEL-MEN-OSUS MONS
ET TOTA AEGYPTUS
IOBACCHI
LIBYAEGYPTII
RUADITAE
Lycomedis Palus
ABROCHOS REGIO
SCITHIACA REGIO
Bacchis
Acanthon
Arsinoe
Stathopolemais
Dionysias
Heraclia Civitas
Oxyrynthos
Cinopolita
Mercurii Civitas Magna
Custodiae
Lycon
Hypsile
Crocodilorum Oppidum
Ptolemais Ermii
Abydus
Diovel
Iovis Civitas Parva
THEBAIS
Papanis
Tathyris
Hermonthis
Latorum Oppidum
Apollo Civitas Magna
Phonthis
Mons Lithos
Nilus
Still Civitas
Memphis
Aphroditopolis
Heliopolis
Ancyra
Arsinoe
HEPTANOMI
Cynopolis
TUS
Acoris
Alabastrorum Oppidum
Antinoi
Troiti
Antaei
Leontopolis Mons
Passalis
Panon
Lepidotorum Civitas
Chenoboscia
Caena
Coptos
Apollinis Civitas Parva
Tuphium
Achnubis
Lucina
Tol
Ombi
Syene
Dedecachoenus Pulle
Ptolemaei Thesaurus
Pselcis
Mons Pentadactylus
Mons Porphyrites
Mons Smaragdus
Mons Lepti Dendi
Mons Lapidis Specularis
Mons Pentadactylus
Mons Berenicides
Mons Ptolemaei
Mons Argyrus
Mons Elephantum
Mons Ptolemaei
Mons Smaragdus

this undertaking and does not feel impelled to ask : ' How many thousands of workmen were employed, and how many years were spent in completing it ?' Yet, considering the benefit and advantage brought to Egypt by this great work, none ever could sufficiently extol it according to what the truth of the thing deserves. For inasmuch as the Nile never kept to a certain and constant height in its inundation, and the fruitfulness of the country depended upon its uniform and regular supply, this lake was formed to receive such water as was superfluous, that it might neither immoderately overflow the land, and so cause marshes and stagnant ponds, nor, by flowing too little, prejudice the crops for lack of water. Accordingly the king dug a canal from the Nile to the basin, ten miles in length, and three hundred feet in breadth. Into this the water was allowed to run at stated times, and at other times it was diverted and turned over the cultivated land for seasonable periods, by means of sluices which were opened or closed, not without great labor and cost. This lake continues to the benefit of the Egyptians for these purposes to our own time, and is called the Lake of Myris or Meris to this day."

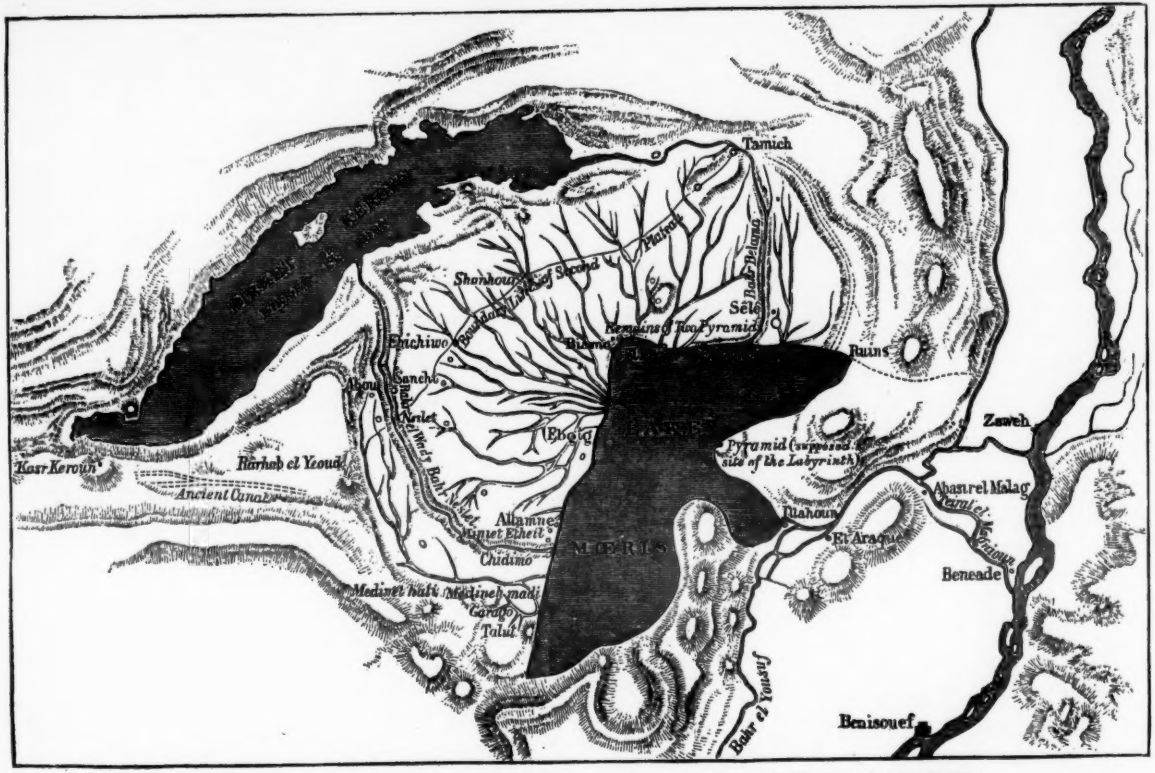
The chief facts given by Diodorus had been anticipated by Herodotus and were confirmed by Strabo and Pliny. It was thus that the attack upon the credibility of Herodotus in reality involved the whole ancient world. Readers and purchasers of books must be held responsible for the demand which creates the supply. Cæsar and Cicero, as well as Plato and Aristotle, would share in the condemnation, although actual mention of Moeris found no place in their works.

The plain account had been flatly contradicted. It was supposed that the observer "embraced in his measurement the whole water system of the Fayoum," or had "confused units of measure," or "the direction of the canal with that of the lake." The accounts of Herodotus (B. C. 454), Diodorus (B. C. 20), Strabo (B. C. 24), Pliny (A. D. 50–70), were declared to be "widely different" and "irreconcilable." Finally the scientific world came to the unanimous conclusion that Moeris was "an artificial reservoir, forty-five miles round, twenty-five feet deep at high Nile and drained at low Nile when the waters had been used upon the fields of the Fayoum. It was everywhere stated that the position of the lake had been satisfactorily determined, in this sense, by M. Linant de Bellefonds. The map reproduced from the "Egypt" of Canon Rawlinson (1881) shows the accepted view.

The French Government had also printed upon its map (1882) that the Memoir of M. Linant contained all the information which could be desired. The name of Rawlinson, identified with wide-spread geographical knowledge, a thorough acquaintance with Herodotus and the current researches recorded by the Royal Geographical Society, is sufficient to show that no suspicion of error on Linant's part was then entertained.

It is not necessary or expedient to trace here the successive steps which have resulted in our possession of an immense body of accurate observations made by a series of experts. Cartography, geology, history and archæology are represented by men of high rank, while from the Premier of Egypt to the Prime Minister of Great Britain, documents have been issued showing

MAP OF THE FAYOUM. According to Linant de Bellefonds.
From Rawlinson's Egypt, 1881.
XIIM



MAP OF THE FAYOUM, SHOWING THE BIRKET-EL-KEROUN AND THE ARTIFICIAL 'LAKE MŒRIS.'

According to Linant de Bellefonds. From Rawlinson's Egypt, 1881.

that the suggestions, embodied sometimes in little more than a pregnant phrase, are deemed to have a bearing upon the welfare of Egypt, the future of Africa, and the imperial interests of more than one Great Power. "Beside Lake Moeris," said Herodotus, "lies the Labyrinth. I visited this place and found it to surpass description." Beside the Fayoum and Raiyān basins in their physical conditions as developed by the engineer lies an edifice which has some of the romantic elements of the palace of Aladdin. The lamp which traces its walls reflects a thousand figures weird, and yet with many a familiar feature. In its twelve halls are throned twelve patriarchs. The history of one, at least, who dwelt on the banks of the Nile, is a household tale on the slopes of the Himalayas, and the prairies of the West. Into these sinuous passages and recondite researches we may not now enter. The Rabbi Benjamin of Tudela points to this "land of the West" (Pi-Tum), and says: "Here is Pithom. Here are the remains of the buildings erected by our forefathers." Jablonski could write, but dared not publish, that the Fayoum was the land of Goshen, vainly sought by the modern scholar in the pestilential marshes of Menzaleh, or the scant strip traversed by the Ismailia canal. The only questions we are authorized to discuss are those purely geographical points, which were outlined by the President of this Society in the remarks in which he summarized the issues raised in the former paper on Lake Moeris. He assumed that the geographical features set forth with such detail and minuteness were accurate and trustworthy. Further evidence on this point will be duly marshalled and original authorities cited. An examination had been

made of all the cartographical evidence from the time of Claudius Ptolemy. The fac-simile of the map of Egypt from the edition printed in Rome in 1508, and similar to several of those manuscripts which abound in the Vatican and other European libraries, can now be compared with an official map, stamped with the approval of the International Jury at the Paris Exposition.

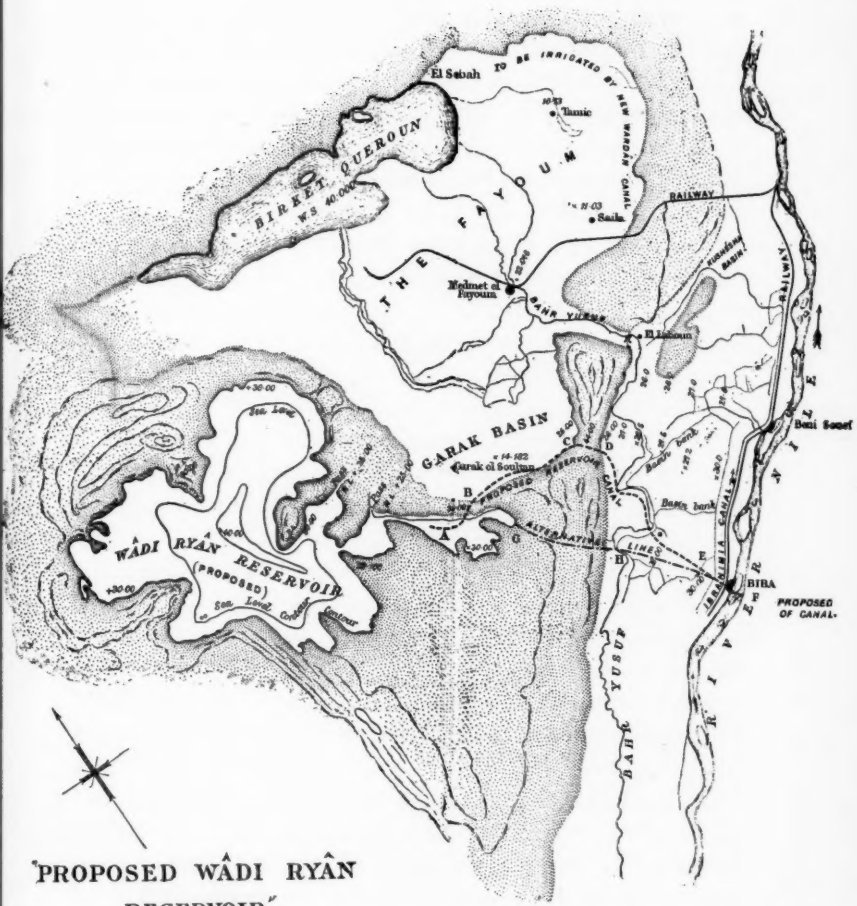
The undoubted existence of comprehensive and stupendous works, still used for their original purpose after the lapse of 4,000 years, shows what estimate should be formed of the capacity of the rulers of Egypt to design and its inhabitants to accomplish. It has an important bearing upon current philosophy and the strangely rash and incoherent assertions of rate of progress and development.

The wish of your President has been fulfilled. The condition of things in Egypt has brought about a survey of this neglected region, not merely with a view to gratify curiosity in respect of its past condition, but to point out the means of guarding against calamitous results from the action of the Nile. These investigations are apparently on the eve of being turned to practical account, and a part of the surplus of the inundation diverted into the Wadi Raiyān. The lesson has already been taken to heart in the New World. The Mississippi and the Rio Grande will yet be treated as the Nile. The engineers, who trace back their technical education in geometry to the engineering schools in the University of Memphis, are scanning with interest the tradition that makes the Patriarch Joseph the founder of their profession, and studying with profit the mighty works that were done of old and still endure.

Curiosity has, unfortunately, also been directed to the archæological treasures of this region. Savage attacks have been made upon its monuments, and thousands of tombs rifled with hideous disregard of decency. It tempts one to deplore that so much had to be said, and to guard with jealousy the secrets still undisclosed. It is for the members of this Society to use their moral influence to secure to Egypt the undisturbed possession of the treasures accumulated in the past, as well as to aid its industrious peasants to obtain such further benefits from the Nile as will put the government once more in a position to devote its surplus earnings to the advancement of art and science within its borders, and extend humanizing influences through Central Africa.

The accompanying map—reduced from the large map 1:50,000—prepared in the Department of Public Works in Cairo, succeeds and replaces several smaller maps, resulting from the surveys made by me, or by engineers put at my disposal by the Egyptian authorities.

Colonel Ardagh, C.B., R.E., then chief of staff to the British army of occupation, but now holding the high and responsible position of Secretary to the Viceroy of India, was the first English officer to visit the Wadi Raiyān. At the meeting of the British Association in 1887, before the London Chamber of Commerce in 1888, and in the Proceedings of the Royal Geographical Society in 1889, he has enforced the importance of the Raiyān depression. It was largely due to his support that the Irrigation Department consented to further an official examination of this area. The scientific world owes him this addition to the large debt which it acknowl-



"PROPOSED WÂDI RYÂN RESERVOIR".

From Egyptian Irrigation, by W. Willcocks, 1889.

edges for his topographical labors elsewhere, and his map of the neighborhood of Tel el-Kebir.

Captain Surtees, for several years on the staff of the Egyptian army, whose military services had been fully appreciated, after his return from the mission to Central Arabia, on which I accompanied him, was detailed in 1887 to examine the Fayoum in the strategic aspect, which had been outlined to General Sir Evelyn Wood, and to join me in an expedition to settle the western limits of the two depressions. The results are recorded in official documents in the Foreign Office, and in the Proceedings and on the map of the Royal Geographical Society for that year.

The Paris Geographical Society had early recognized the probable value of these investigations. In 1886 it preferred a request for an address, which, in compliance with their wish, was made without notes, but a summary was published in their Bulletin.

The *Exposition Universelle* offered an opportunity of exhibiting a number of maps, surveys and official documents. These satisfied the experts, who represented the various countries of the world, that the generous confidence so liberally extended to a stranger had materially helped to protect and mature the ideas which had, in fact, first found shelter in the pages of the *Revue Archéologique.* This collection of maps included a portion of a hieroglyphic map, whose central part is preserved at Būlaq. The remainder was found in a country house near Lincoln, England, and the fact announced in a volume offered by Egyptologists to Dr. Leemans. At the Congress of Orientalists in Vienna, Dr. Pleyte of Leyden, who was the first to embody the Raiyān basin

in any map published on the Continent of Europe, brought to my notice a papyrus in the possession of Dr. Reinisch. It was readily identified as the fragment stolen from the museum at Būlaq, of extreme interest in cartography, and whose probable destruction had long been lamented.

Various reports on the Raiyān Basin by Sir C. C. Scott-Moncrieff have less value than would have been anticipated from the world-wide reputation of the author of "Irrigation in Southern Europe." It naturally seemed to him scarcely within the bounds of ordinary human events, that, in a brief interview, one whom he had never seen before, who was to leave Egypt the next morning, should draw a few lines on a scrap of paper, add and subtract a few figures, and offer to the future Under-Secretary of State for Public Works, without any condition or apparent expectation of reward, an unrivalled occasion for enhancing personal reputation, saving a distressed people, and reconciling in one great enterprise the conflicting interests of France and Great Britain. Whether those lines were worth hundreds of millions of dollars is still a matter of calculation. The estimates made by Sir C. C. Scott-Moncrieff, which at Sir Evelyn Baring's suggestion he published in the *Journal Officiel*, a year since, were—confessedly—intended to minimize the dissatisfaction expressed at the delay in the actual execution of the project. They showed a net profit of ten per cent. on the estimated cost, but must be considered as the work of the statesman, not of the engineer. He treated the death-rate of Cairo—92.7 per 1,000 in July—as a *quantité negligeable*, and the obligation to furnish water to the Suez Canal Company, as well as to

the peasants of the Gizeh Province, for which they have long been annually taxed, as the payment of a debt, and therefore not a source of additional revenue. The quittance of these and similar obligations was excluded in the estimate of profit to be obtained from the execution of the scheme.

Lieut.-Col. Western, C.M.G., R.E., Director-General of Works, was charged in 1887 with an examination of the whole project. His great ability and thorough knowledge of construction have been proved, notably at the Barrage, but also in many minor works. If his estimates of cost seemed large, and even the enormous area of three millions of acres, to be added to Egypt by the creation of the Raiyān Reservoir, capable of increase, his invaluable reports are not to be criticised. His personal examination of the region with further facts have combined to modify, to some extent, his conclusions in a more favorable sense. These reports constitute the basis on which everything has since proceeded. They were the complete official acquittal of those who had preferred the statements of Herodotus and the maps of Cl. Ptolemy to those of Dr. Lepsius and the modern cartographers.

Lieut.-Col. Ross, as Inspector-General of Irrigation, has, like Sir C. C. Scott-Moncrieff, been in a measure hampered by his official position in the expresion of opinion. His map of the Fayoum and Raiyān depressions is constantly receiving new items of great interest, especially in that northern part where a large area of cultivable land was found by me, and brought to the notice of the British and Egyptian Governments at a time when the refugees from the Sudan were demanding aid to establish new homes. To Colonel Ross

was due the diagram of the rise and fall of the Nile for fourteen years, which was a prominent feature in the exhibit in Paris; as well as countless suggestions and continuous moral support.

The relief-map of the Raiyān Basin—horizontal scale 1 : 100,000; vertical scale 1 : 10,000—made by M. Muret under my supervision, aided by photographs, was so striking in its contrasts, that it completely broke up, in the minds of all who studied it, the fatal error, so universally entertained, that the desert traversed by the Nile is a sandy plain. The difference of scales is unusually great, and therefore far less deceptive than those maps in flat relief, which seem to the inexperienced eye to give a natural appearance to the mountains and valleys.

There was also submitted for the examination of geographical experts a large map of the North-eastern Delta with the areas actually productive or capable of being rendered cultivable by an additional supply of water free from alluvial deposit. This map was due to Mr. Garstin, who, as Inspector of Irrigation for the Eastern Delta, is well acquainted with the region.

Major Brown, R. E., is in charge of the provinces of Middle Egypt, traversed by the Bahr Jūsuf or River of Joseph. Why should oriental scholars have overlooked those written traditions, which, dating back from the 9th century to the period when the Book of Genesis first embraced the 49th chapter, have always assigned this work to the Hebrew Premier, whose sagacity founded the temporal fortunes of his race? The claim put forward in behalf of Saladin—chivalrous opponent of Cœur de Lion—comes nearly two cen-

turies after Masudi, in A. D. 956, had described the island and habitation of Joseph, the province of *Ben Jusuf*, as it is suggestively termed on Mercator's map, and the Beni-Suef of our own day. Several beautiful photographs, taken by Major Brown with artistic taste and technical skill, illustrated the lecture delivered before this Society and the expeditions we made, in which we followed this great stream. Like the reputed author of its existence, it bears a name to show, that, separated from the parent Nile, it takes away the reproach of barrenness from a large district and adds yet another province to the area assigned by Semitic tradition, ancient and local, to the shepherd kings and their allies —the Beni-Israel.

Mr. Marshall Hewat is Inspector and Director of works in the Fayoum. The photographs showing the palace of the Mūdir were proofs of the hospitality so often enjoyed, and of the information obtained directly from him as well as from the governors—my old friend Murad Pasha, and the present Governor, an accomplished and learned professor, Latif Bey Salem.

Nubar Pasha had at various times urged upon His Highness, the Khedive, and his immediate associates in the government of Egypt, the necessity of providing an additional supply of "*sefi*," or "low Nile" water, himself prepared with a project for a great dam at Silsileh. The danger of creating a storage reservoir by a dam across a large stream is well known. The engineer seeks, by preference, to use some supplemental stream, issuing from a lateral valley.

The Silsileh project has of late been associated with the name of Mr. de la Motte. It was, however, so ob-

vious a means of accomplishing a desired object that it had been mooted since the expedition of Bonaparte, and its advantages and serious dangers carefully weighed by successive ministers, especially by Ali Pasha Mubarekh, when Minister of Public Works. The Khedive opposed it, with characteristic soundness of judgment. He has recently been termed by the late Consul-General of the United States a model prince. His sons will soon visit the United States, and this Society will, without doubt, take that occasion to express their appreciation of this ruler of Egypt, who is the devoted husband of one wife, an affectionate father, profoundly religious, wisely administering his private affairs, and discharging his duties as Viceroy, under circumstances of extreme difficulty, with a tact and zeal which have won the respect of all who know him, and the loyalty of his people.

In the *Zeitschrift der Gesellschaft für Erdkunde* (Berlin, 1886, No. 2), Dr. Schweinfurth has given an account of his expeditions through the Muellah, Raiyān and Fayoum depressions, with a map. It is in the form of a letter to Dr. Ascherson, and contains much valuable geological information. It will be remembered that it was stated in the Journal of this Society, that I had received information of the existence of a temple in the desert to the north of the Birket el-Qerūn. Its position was indicated to the north of the ruins described by Dr. Lepsius, at Dimeh. The engineer, however, whom I had taken with me to Dimeh, insisted upon my agreement to return him to Medinet before a given date. Dr. Schweinfurth found the building without difficulty, and enjoys the credit of having been the first

European to visit and describe it. Accompanied by Lieut.-Commander Ackley, U. S. N., I visited and photographed it in March, 1889. It is a rectangular building, about 70 feet in length, 25 in depth, and 18 in height. The photographs were examined by MM. Chipiez, Maspero and Naville. They consider the structure, in all probability, of extreme antiquity, *ca.* B. C. 2,000. Its geographical importance is very great. Situated five miles from the shore of the present lake, at the level of high Nile at el-Lahun, and at the foot of the steep terraces which bound the depression to the west, it must have been constructed when the Fayoum was a vast lake. It would then have been a point of military importance on the desert road from the south to the Natron lakes or (the ancient) Alexandria.

Dimeh is also detached; so that it would appear as an island rising with steep sides out of the lake, where it was deepest. If Diodorus states that he saw such an island, crowned with two pyramids, against which were colossal seated figures, and a tomb, where the water was 300 feet in depth; and, if in the Fayoum there is a detached hill, with a long horizontal street or quay, covered with immense masses of unburned brick and stone, which, when the Fayoum served as a back-water and flood-escape for the Nile, may have corresponded to this description, is it creditable to insist any longer that the statements of the Sicilian geographer and traveller are false? Herodotus before, and Pliny afterwards, refer to the same remarkable feature. The pyramids of el-Lahun and Hawara, at either end of the Fayoum canal, are of unburned brick. The island-pyramids may have been of the same material. In any event the

stones at Biahmu ought never again to appear in any argument as in any way identified with these pyramids, or with the statues as *in situ*. It is an elementary rule of evidence, which is constantly ignored by untrained minds, that you cannot discredit your own witness. The only knowledge of these structures is derived from the written statements of Herodotus, Diodorus and Pliny. The whole story may be rejected, but it is puerile to admit their existence and then to identify pyramids and statues with extant remains on the upper terrace of the cultivated land, when the only important fact was the indication which the island furnished of the great depth of the "excavated" or "eroded" depression.

The contours of the Fayoum have not yet been completed. It was urgently impressed upon Sir C. C. Scott-Moncrieff, in 1886, that lines should be run which would determine the entire area of the alluvial deposit of the Nile, from Assuan to the Mediterranean. It might have been done without appreciable cost to the Egyptian Government had my offers been accepted. Unless, however, an engineer had been lent to me who would be responsible to the Government for any error, neglect or disobedience of orders, the Public Works Department would not have accepted the work as final. Some such survey will, it is believed, be undertaken at no distant date.

The contour of high Nile, quitting the Nile Valley at el-Lahun, passes to the south of Gharaq, enters the Wadi Raiyān, encircles the Wadis Lulu and Safir, re-enters the Wadi Raiyān, crosses the entrances of the Oases of Muellah and Khoreif, and returns into the Fayoum after girdling an area of 250 square miles. This same contour, of R.L. + 30, would continue

round the west of Gharaq towards the north and east, and then passing westward to the south of Qasr Qerūn, turn to the north, and, sweeping out into the desert behind Dimeh to the ancient temple, curve towards the east, and return to the south and the Valley of the Nile along the foot of the hills which overlook the ancient bed of the Bahr Wardan.

It may be said that this line when it had reached el-Lahun and the cultivated land in the province of Beni-Suef, would, especially if the minor sinuosities were measured, attain a length of 450 miles. The entire basin, thus encircled, would apparently cover over 1,300 square miles, and a large part of it would be much below the level of the Mediterranean.

This was the immense natural back-water of the Nile, which, according to Semitic tradition, was divided between the fertile province to the north, when el-Hūn or Phiom (the Sea) became el-Fayoum (Alf-iom, the land of a thousand days), and the Raiyān Moeris, or reservoir to the south.

If the Arab tradition is correct, King Raiyān invested Joseph with the insignia of Prime-Minister as a reward for about 400,000 acres of land, perennially irrigated. Manetho says that this region was abandoned in the religious wars which broke out at the time elsewhere fixed as the birth of Moses. The Birket el-Qerūn rose, if not then, subsequently. The Lake of the Horns submerged once more the district of Qerūn (Heroon-polis) to the upper plateau, where repeated use of the word Sen points to Ha-Sen (Gesen, Goshen), Asenath, the wife of Joseph, and Arsinoe, its Ptolemaic name. Those united depressions formed the Moeris of Herodotus.

The region might well be described, in the fifth century before our era, as a vast reservoir and back-water from the Nile, with a maximum level above low Nile at Memphis, fifty miles south-west of that city, about fifty fathoms deep, longer than its width, extending from north to south, surrounded by the Libyan desert, with an indented coast as long as the smooth sand-banks which form the Mediterranean shore of Egypt, blue, full of fish of twenty-two species, with flood-gates at the double mouth of the canal, whose embankments and clearance from silt annually cost $50,000 (£10,000), by which the engineers relieved Egypt from a dangerous flood, or stored up and distributed the water which entered or issued from the canal. A multitude of fishermen on its borders were engaged in catching and curing the fish which bred and multiplied in the lake, while the royalty on the fisheries averaged $250,000 (£50,000). Its waters escaped along the hill above Memphis. About the middle of the deepest part was an island. On it were two pyramids and a tomb. Against the structures were two figures, seated upon thrones. The height of the pyramids equalled the maximum depth of the lake.

The *Lacus Meridis* of the Ptolemaic maps—the Raiyān Moeris—is confined to the Raiyān depression, with an extension into the narrow valley of Muellah. The term Raiyān retains the name of the monarch honored by Islam, associated locally with the spring in the southernmost bay of the depression, and closely connected by derivation with the idea of irrigation. Moeris, of course, is, like the Latin word *mare*, or the English "mere," the exact equivalent of lake.

THE RAIYĀN PROJECT.

The whole subject of Egyptian irrigation has been treated with conspicuous thoroughness and ability by Mr. W. Willcocks, of the Indian Public Works Department, and one of the four Inspectors of Irrigation, who, under Col. Sir C. C. Scott-Moncrieff, Under-Secretary of State for Public Works, and Lieut.-Col. Ross, Inspector-General of Irrigation, succeed the Hyksos, Persian, Greek and French in foreign control of the native engineers. His book embodies the information collected during four and a half years of the irrigation systems of Egypt, and a *resumé* of the works carried out by Sir C. C. Scott-Moncrieff. The literature of irrigation, in general, is singularly scanty. Scarce a dozen titles can be found in the catalogue of any library. The volumes published by the State of California will soon be supplemented by those to be issued from the State Department in Washington. Mr. Willcocks provides a treatise which discusses systems of irrigation practised with eminent success for 4,000 years. It is curious to read how steel may now be introduced with advantage in the sluice-gates of canals for which the Sphinx was sculptured as warder.

One of its eleven chapters, one-twelfth of the entire contents of the book, is devoted to the Raiyān project. The whole volume is replete with information and will be found to be of the greatest value for all who are engaged in land reclamation schemes in countries where the rain-fall is insignificant. Extensive citations from this book have an obvious advantage. They are free from suspicion of exaggeration. They present prolonged and recondite researches reduced to logical sequence and

coherent form by a practical engineer, who contemplates that he may himself be intrusted with the execution of the works he recommends, and required to earn the interest which he promises on the capital which he estimates as sufficient. Mr. Willcocks appears to urge that summer irrigation impoverishes the land, and that basin irrigation, or an annual crop from flooded land is, in the long run, more productive. He has, however, explained that he objects to perennial irrigation when unaccompanied by those periodical floodings, in which the rich red waters of the Nile deposit the detritus of the Abyssinian mountains, mingled with the decaying vegetable matter transported by the White Nile from the swamps and marshes of Equatorial Africa.

Colonel Ross, in his admirable preface (p. xv.), shows the difficulty of draining Middle Egypt, especially the tract alongside of the Ibrahimiyah Canal, or, in other words, by the side of the railway between Beni-Suef and Assiūt. The Nile flood absolutely bars drainage into the Nile; the Raiyān basin offers the ultimate solution of this problem. In future years—he says—after the Wadi Raiyān canal has been opened, and the summer supply of the Delta assured, the money now spent in raising water to irrigate can be spent in draining the extensive northern swamps; the irrigation water being delivered free-flow.

It is simply incredible that strenuous efforts are continually made under the direction of the Great Powers, who represent civilized Europe, to destroy the navigation of the Nile. Artificial obstacles are placed across the canals, and all the mouths of the Nile barricaded as soon as a low stage of the water is reached. The

financiers, protected by British bayonets, force transportation out of its natural channels on to the railways, or delay it for twenty-four hours at a bridge, for the more convenient collection of tolls, whose character has been stated with entire frankness in the official utterances of Sir H. Drummond Wolff and Sir J. Fergusson. The benefits of the Raiyān scheme include improved internal water communication.

Colonel Ross gives an analysis of the chapter which treats of "the recently developed project of the Wadi Raiyān." "The storage of water in this sister depression to the Fayoum will remove many difficulties about summer supply. The principal difficulty is to get the capital, either by borrowing, or forming a company to furnish the water in exchange for some concessions. Considering that it now costs £60,000 ($300,000) to pump five million cubic metres (say 1,250 million gallons) of water into the Behera province, it does not seem a bad bargain to borrow a million and three-quarters ($8,750,000) to furnish twenty million cubic metres of water daily (*ca.* 8,000 cubic feet per second) and even more, *i. e.*, to pay £87,500 ($437,500) a year at five per cent. interest." As Colonel Ross points out, Egypt could borrow the necessary funds at five per cent. In other words the Raiyān project is considered by him an absolutely safe investment.

Two propositions were submitted to the British officials in Egypt.

First. Having placed unreservedly at their disposal all the information I had acquired, and having submitted to the fantastic, and, in my judgment, cruel and extortionate demands upon my life, health and private resources

in doing their work, in months spent in the desert with their engineers, or in putting my knowledge in a form in which it would influence the scientific, political and financial world and smooth their path, I offered to efface myself and leave them untrammelled in the execution of the work and the appropriation of the merit.

No remuneration of any kind, direct or indirect, was to be given me. It was to be considered sufficient if I were allowed to escape scot-free, without the *peine forte et dure*, which in Goethe's opinion, and my own experience, are still ready to invest with picturesque accidents the most judicious efforts to ameliorate the human lot or add to its intellectual wealth.

Second. When it was insisted that the gift to Egypt was incomplete unless the canal itself was finished without risk or cost to the bondholders or the taxpayers, and a net surplus paid into the Egyptian treasury, it seemed, again, that this was no function of mine, or necessary part of my work. The scientific examination of the Moeris problem required but a single visit to the untrodden summit of the Haram Medhūret el-Berhl, while any engineer could be invited and paid to spend thirty days in running lines of levels through the Haret el-Gehenna, whose name is well deserved. So also the Great Powers have furnished their ward with a financial staff, whose experience ranges from St. Petersburg to Calcutta. It was no business of mine to obtain the opinion of Lord Rothschild, the Council of Foreign Bondholders, the Imperial Ottoman Bank, or Sir J. Lubbock.

Two offers were nevertheless submitted. The first left to that bureau in the Department of Works specially created and charged with the expenditure of a mil-

lion of pounds, guaranteed by the Great Powers, all the engineering work. My confidence and that of the Egyptian Government in the skill and energy of Colonel Western and his staff was so complete, that there was little difficulty in obtaining authority from capitalists to provide the government with funds as the work advanced, secured upon the works themselves, with such participation in the benefits as might be determined. A scale was suggested.

The second offer simply accepted the estimates of the Egyptian Government and contracted to complete the work on their terms. We would agree to deliver the Raiyān Canal and flood-gates, according to specifications, for an annual payment not exceeding £50,000 ($250,000), purchasable for a lump sum of £1,000,000 ($5,000,000). The annual rent was in no case to exceed 70 per cent. of the net profits obtained by the government. These offers have not so much been rejected, as their final consideration postponed. They have been repeated and defined in the "Note on the Raiyān Project" submitted to the Department of Public Works in April, 1889. There is very little doubt, however, that the Egyptian Government, having expended another year in striving to find some other way of accomplishing the result, will borrow the money, guarantee the interest and itself do the work.

Considering its importance and the acknowledged benefits which will be immediately conferred upon Egypt, and, through the Valley of the Nile on the Equatorial Provinces, which have been transferred to the Mahdists, since the British occupation, as the result of the military and civil operations conducted by Hicks,

Gordon, Wolseley and Stanley, advised by Sir E. Baring, no personal interest should be allowed to intervene. What, in comparison with such results, is the naked assertion of the abstract right to bring to maturity a project, although the inception is admittedly the offspring of one's brain and heart, whose infancy required sedulous care, and the infant, destined to be a Hercules, was cradled in a shield and defended by the sword?

There are four possible channels by which the Raiyān Basin can be put in communication with the river. Two only are considered by Mr. Willcocks. The Abu-Hamed route involves a contoured canal in the desert along the southern edge of the Fayoum. It was regarded by Colonel Western as in all respects feasible at a moderate cost. Whether a shorter line, through the limestone hill, would, on the whole, be preferable is not, for the moment, essential. The former line fixes a maximum cost which can be used in working out the other elements of the project.

The only alternative scheme for the impounding of the surplus flood is that associated with the name of M. de la Motte. He proposes to build a dam across the Nile at Gebel Silsileh, 85 kilometres (50 miles) below Assūan (the first cataract) and make a reservoir in the desert plain of Kom Umbos. "This scheme is in a very embryo stage, and needs very much more working up to bring it to the complete and perfect state of the Wady Raiyān project, but it is roughly calculated to cost £4,000,000 ($20,000,000)" (p. 322.). Its great weakness lies in the dam 60 feet high founded on a not very homogeneous sandstone. Other objections include the detention and deposit of silt, with the consequent

raising of the bed of the reservoir, and annual diminution of its capacity.

The summary of the Raiyān Project, as given by Mr. Willcocks, is substantially in the following words; the parentheses are mine:

The cultivated area of Egypt is 4,955,000 acres, and the land capable of reclamation in Lower Egypt, (exclusive of over 1,000,000 acres contained in the areas now abandoned to the Mediterranean, and forming the brackish lakes bordering upon it, together with at least 500,000 acres elsewhere) is 1,260,000 acres. If one-third of the cultivated land and the whole of the land to be reclaimed were to be irrigated in summer, there would be required a summer supply of

$$\left(\frac{4,955,000}{3}\times 26\right)+\left(1,260,000\times 40\right)=93,000,000$$

cubic metres per day, of which the lands to be reclaimed would alone require 50,000,000 cubic metres per day. The mean summer discharge of the Nile is 42,000,000 cubic metres per day (16,800 c. f. per second) at Assūan, while there are years when it falls to 24,000,000 cubic metres per day, and hence the impossibility of doing any reclamation by summer cultivation on a large scale without storing water somewhere. The best known scheme before the public is that of Mr. Cope Whitehouse for storing water in a reservoir to the south-west of the Fayoum. This reservoir would be fed by a canal from the Nile in flood, and discharge back into the Nile in summer. The time during which the reservoir would be drawn upon would be from the 15th of April to the 25th of July, when the Nile is at its lowest. The elements of the problem, therefore, are the following:

First. A *basin* of sufficient magnitude to receive the Nile in flood; and of sufficient area to yield between the flood-surface of the intake, and the low-water mark of the outflow, all the additional water required during the hundred days of insufficient Nile.

Second. A *canal* capable of passing a certain quantity of water into the basin. If the section of this canal is only large enough to discharge the daily supply required from the basin, (when filled and used as a reservoir) it will take a considerable number of years to raise the water surface in the depression to the level of low Nile, as the bottom of the depression is over 200 feet below the level of cultivated land in the Nile valley, on the same parallel. If the canal is of large section, it would fill the reservoir in three years, and could be used as an escape in time of dangerous flood.

Third. The determination of the *water-surface levels* of the Nile, maximum, minimum and mean, during flood and summer, with the discharges corresponding to the different levels.

Fourth. The determination of the *minimum level of the Nile in flood*, below which it must not be allowed to fall. In other words, the quantity of water which could be delivered at the Raiyān Escape without prejudice to existing interests.

Fifth. The *Raiyān works to the west of the Nile Valley*, excavations, earth-works, pitching; and masonry works needed for regulation.

Sixth. The *works in the Nile Valley* needed for the passage of existing canals, drains, and the railway, by the large flood canal or escape.

Seventh. The *time* required to fill the reservoir: the quantity of water utilized after loss by evaporation and absorption has been eliminated.

Eighth. The *quality* of the water stored.

Ninth. The *effect* of reservoir water on the Nile water in summer in respect to the health of the towns depending for their water supply on the Nile.

Tenth. The *passage of the water* from the reservoir in summer through the existing canals in Lower Egypt, on the top of the ordinary summer supply, in order to reach the lands near the sea.

Eleventh. The *preparation of the lands to be reclaimed* so that the water may be utilized when it is obtainable.

Twelfth. The *cost*, capital required and means of earning interest on the capital.

"Granting the great advantages to be reaped from an increase to the summer irrigation of Egypt, and the necessity of this increase if the resources of the country are to be fully developed, there is no scheme more likely to attain this end than Mr. Cope Whitehouse's project for a reservoir in the Wadi Raiyān, South-west of the Fayoum. At no other place in Egypt can a reservoir be obtained without first building a dam across the Nile." Plate two gives a plan of the reservoir and the adjacent valley of the Nile, reproduced from Mr. Willcocks' work, without any modifications; which, nevertheless, especially in nomenclature, might have advantageously been made. "This plan was reduced from the (latest) original plan, prepared by a staff of engineers working under the orders of Colonel Western, Director-

General of Works. The Ministry of Public Works is examining the project in a very thorough manner; Colonel Ross, Inspector-General of Irrigation, examining the irrigation side of the question, and Colonel Western the constructive."

"Given the reservoir, the section of the canal, the water level in the Nile, and the other factors in the problem, it is a question of permutations and combinations as to which is the best method of carrying out the project. A small canal will cost little; but it will take many years to fill the lake, the interest charges will run up, and the water of the lake will possibly (?) become brackish. A large canal will cost much; but it will soon fill the lake, the interest charges will not mount up, and the water of the lake will possibly not be brackish. A large canal will also be of use in reducing appreciably the water level of the Nile during a very high flood. A very high flood comes seldom, but a breach of the Nile banks in flood is the greatest calamity which can overtake the country; and any scheme which promises relief to the country in flood deserves careful consideration."

With these preliminary remarks Mr. Willcocks proceeds to consider the twelve elements of the problem, as he conceives it, in detail. The parentheses here also contain explanatory remarks by the author of this paper.

First. *The size of the reservoir.* This is a fixed quantity. In Colonel Western's office, the large scale plan has been contoured and the areas covered by the different contours have been measured by a planimetre. The following table (abridged) contains this information.

AREA AND CUBIC CONTENTS OF THE RAIYAN RESERVOIR.

R. L. of Contour.	Area in Square Metres.	Area in Egyptian Acres.	Contents of Reservoir in Cubic Metres, below the Contour.
30	686,600,000	163,475	20,559,640,000
25	618,300,000	147,214	17,297,390,000
20	550,000,000	130,952	14,376,640,000
10	397,904,000	94,739	9,637,120,000
Sea level.	301,100,000	71,690	6,142,100,000
—10	231,800,000	55,190	3,477,600,000
—20	163,075,000	38,127	1,503,225,000
—30	55,562,500	13,229	410,037,500
—40	22,037,500	5,247	22,037,500

The maximum flood level of the Nile at the (proposed) take-off of the reservoir canal is Reduced Level + 31.8 metres (about 100 feet above the Mediterranean), the ordinary high flood level is R. L. + 30.3, the low flood level is 29.0 metres, and the summer level is about 22.0 metres above mean sea. These levels are referred to the Barrage zero, or mean Red Sea, .60 metre above mean Mediterranean Sea.

Colonel Western thus describes the Wadi Raiyān: "This valley, a depression in the Libyan Desert, discovered by Mr. Cope Whitehouse in 1886 (this date being taken as the first official communication to the Department of Works of a survey verified by lines of levels, as distinguished from aneroid observations), lies immediately to the south-west of the Fayoum province, but separated from it by a range of low hills, averaging some 6 kilometres ($3^{1}/_{3}$ miles) in width, and with heights of about 60 metres (196 feet) above sea level. Two passes, however, leading from the Garak (the Rharaq of Schweinfurth, the Gharaq of the author's maps) basin of the Fayoum, with levels of about + 26 metres, have been found in this dividing range, and, except for these two passes or entrances, the Wady is everywhere

The Raiyān Basin, drawn by Cope Whitehouse, 1888.

bounded by hills of at least + 36 metres above mean sea."

"The soil of the Wady is for the most part composed of desert sand and pebbles, overlying in places a yellow clay, but this desert sand is for about one-sixth of the area hidden by drifted sand-hills, or ridges rising some 5 to 10 metres above the general plain. Towards the north of the Wady, there are two fresh water springs (but no inhabitants) and near there, a few date trees and some brushwood grow. The deepest level of the Wady Raiyān reaches 40 metres below sea level (about 220 feet below high Nile). To the south of the Wady and connected with it at a level of + 55 metres is the Wady Muellah, a valley about 1½ kilometres width and seven length. Its lowest depression is + 25 metres (about 35 feet below mean high Nile near Behnesa, opposite its southern extremity). In the Wady Muellah there are ruins of ancient buildings (with fragments of a Greco-Roman period, further identifying the spot as the Dionysias of the Ptolemaïc text and map). There is a fair amount of coarse vegetation near them."

"Two other small depressions have been found, connected with the Wady Raiyān at its north-eastern extremity at a contour lower than the level of the flood Nile. They lie to the south of the Gharaq basin of the Fayoum province and are separated from it by a ridge with a level of + 35 metres, one kilometre in width. The easterly depression (the Wadi Lulu, or Valley of the Pearl, a modern name given to it by the author of this paper) is about 10 kilometres in length by 4 kilometres mean width and has a bottom at about + 15 metres."

SECOND. *The Reservoir Canal.* "Referring to the

plan," says Mr. Willcocks, "it will be seen that Biba is the point chosen for the take-off of the canal from the Nile. It is 163 kilometres above the Barrage along the deep channel of the Nile (85 miles south of Cairo by rail). Of course any other point near it may be chosen, but considering the lie of the basins and their feeders, it will be difficult to choose a better place. On the plan there are two lines given for the canal; one is called the 'Proposed Reservoir Canal' and has been (repeatedly) levelled and surveyed, (examined by Colonel Western in person, and pits sunk to test the character of the material to be excavated). The other is called the 'Alternative line.' All calculations have been made on the former. If the surveyors can find a fairly good line along the latter, it will be decidedly the better line, as it makes straight for the reservoir and avoids the banking up in the Fayoum Valley necessary on the former line."

Neither line presents the smallest engineering difficulty, or would be above the capacity of a native provincial chief-engineer. The direct line involves a tunnel about five miles in length through horizontal limestone. With a bed width of 80 metres, and a height of 10 metres, it would be more convenient to drift a series of openings. Undoubtedly this would be the channel selected if the Irrigation Department was directed, as in the days of Raiyān ibn el-Walīd, the Hyksos monarch, who, according to Semitic tradition, proposed to Jūsuf ibn-Jacoub the problem of regulating the Nile, or when Ipsambūl and the Sphinx were carved in the living rock, and the hills opposite Memphis emptied of incalculable masses of stone.

The splendid effect of the façade with the stream, 250 feet in width, gushing clear and blue from the white portal, between colossi carved with the least expenditure of labor, but the most ingenious adaptation of natural conditions in the stratified rock, would not now have the slightest weight with the Department of Public Works and their financial masters. The passage itself, its forest of columns, the Cathedral-Mosque of Cordova extending miles in length, the vast air shafts, 200 feet in height, corbelled out in mouldings decorated with sentences from the Qurán, telling in words that history of Jūsuf written in water, fruits, flowers, fields and houses, temples and mosques along the River of Joseph and in 'the land of a thousand days' will not be attempted. Such considerations are absolutely alien to the actual administration as controlled by foreign influences.

It would be otherwise if the Viceroy, whose devotion to art and science has been tangibly exhibited, were free to apply the surplus of enlarged revenues according to his better judgment.

"The (total) length of the proposed canal is 46 kilometres (27 miles) from Biba to the point A, in the reservoir. The length of the alternative line is about 30 kilometres (18 miles). The slope of the canal will be $\frac{1}{20000}$, the ordinary canal slope in Egypt. This slope, with a hydraulic mean depth of between six and seven metres (20 feet) will give a mean velocity of about one metre per second (2½ miles an hour), a velocity which allows neither silt deposit nor scour in the Nile Valley."

THIRD. *Flood and Summer Levels of the Nile at*

Biba. As a rule there is such a heavy demand for water during the month of August, that in any but a very exceptional year no water (in Mr. Willcocks' opinion) can be taken from the river, and this month must be left out of the calculations.

DISCHARGE OF THE NILE AT CAIRO.

Month.	Mean discharge in cubic metres per 24 hours.	Feet per second.
January	151,000,000	60,400
February	110,000,000	44,000
March	70,000,000	28,000
April	45,000,000	18,000
May	34,000,000	13,600
June	34,000,000	13,000
July	70,000,000	28,000
August	525,000,000	210,000
September	675,000,000	270,000
October	675,000,000	270,000
November	400,000,000	160,000
December	260,000,000	104,000

The maximum flood of 1874 discharged 1.032 million cubic metres in a single day; the minimum flood of 1877 discharged 465 million cubic metres, or less than one-half that amount.

Mr. Willcocks puts the entire discharge of the Nile during the year at 93,000 million cubic metres. If 3,000 million cubic metres are required for the basins of Upper Egypt, and 50 million c. m. were furnished for daily consumption there could never be a year in which 50,000 million c. m., or double the contents of the Raiyān Reservoir, would not pass into the Mediterranean without contributing in the least degree to the fertility of Egypt. The regulation of the Nile at the Barrage in July and part of August would put a certain volume of

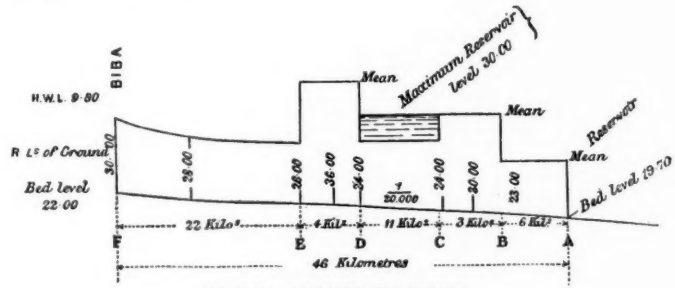
water at the disposal of the government for the Raiyān basin. The summer, or low Nile, level at Biba may be taken as 22.00 metres.

FOURTH. *Levels at which the Nile must be maintained for flood irrigation.* In September a gauge of 16.3 should be generally maintained at the Barrage, though alternate week gauges of 16.3 metres and 15.8 metres (above zero) would suffice for the irrigation until the 10th October. From the 10th to the 20th October, a gauge of 17.0 metres is needed at the Barrage to allow all the high lands to be irrigated for the winter crop. After the 20th October, the canal might take as much as it liked from the Nile, or from the basins above it, except in extraordinarily low years like 1888.

In an average year, from the 1st of September there is available a discharge of 57,500,000 cubic metres per day, increasing to over 100,000,000 on the 15th September. Between the 10th and 20th October, no supply is available, as the Nile berms have to be irrigated, while after the 20th October, the canal can take as much as it can carry. It is better (in Mr. Willcocks' opinion), to depend on an alternate week supply in low years than on any regulation at the Barrage, because the former meets the requirements of Upper Egypt, north of the canal, as well as those of Lower Egypt, while the latter meet the requirements of Lower Egypt alone. A fluctuating supply in the Nile in a high year like 1887, would bring down the Nile banks, but in high years this alternate weekly supply will not be necessary. In the low Nile years, when it is necessary, no harm will be done by a difference of half a metre, which this system of filling will entail.

As far as a high Nile flood is concerned, a canal incapable of carrying 100 million cubic metres per day at the high flood gauges, would be of little use. A difference of 50 centimetres at the Barrage gauge when the readings are between 18 and 19 metres means a daily discharge of that amount. Taking high flood relief as the most important factor in the calculation (of the size of the proposed canal) and the level of the bed of the canal at 22 metres at the take-off, the canal should discharge 100 million c. m. per day with a depth of water of 9.8 metres. A canal with a bed width of 80 metres (250 feet) and side slopes of ½ will accomplish this result.

The following is a rough longitudinal section of the proposed canal.



ROUGH SECTION OF CANAL.

LONGITUDINAL SECTION OF CANAL.

The earthwork estimate is as follows:

From F to E: Length, 22,000 metres; mean depth, 6.5 metres. Contents, 12,370,000 cubic metres. This is capable of reduction by following the Bahr Jūsuf in places.

E to D.—Length, 4,000 metres; mean depth, 15 metres. This section is a soft limestone cutting (to the depth of about a metre, resting upon a very compact clay, impregnated with salt, and dissolving with extreme facility into fine mud), and here the bed may be lowered 4 metres, as recommended by Colonel Western, and the depth of water becomes 13.3 metres. The bed width here may be reduced to

40 metres, which will give such a slight afflux that it will not be felt within 10 kilometres of the head. The material to be removed is 4,484,000 cubic metres.

D to C.—Length, 11 kilometres. The hill (along the southern edge of the Gharaq basin of the Fayoum slopes gently from + 60 m. to + 14 m.), and the canal can follow any contour decided upon (and the required section thus obtained either by a deeper excavation or a higher bank on the lower side—the only one required—as may be considered expedient and economical). If a contour of + 24 metres is chosen (and the bank given a top width of 15 metres), a sectional area for the embankment of 200 square metres will cover all contingencies. The breadth of section, (varying with the irregular edge of the desert, and reaching in some places a width of 1,500 metres, or over a mile), will make up for any loss in depth: material to be handled; 2,200,000 cubic metres.

"C to B.—Length, 3 kilometres, depth, 14 metres, and (bed) width, 40 metres, since this is in part another soft limestone ridge (with pebbles, desert sand and clay): material; 2,352,000 cubic metres.

"B to A.—Length, 6,000 metres, depth, 3 metres: 1,500,000 cubic metres.

The estimated cost of work is:

Section F to E.—	12,370,000	cubic metres at	£.04 (20c.)=	£494,800	=($2,474,000).
" E to D.—	4,484,000	" "	" .10 (50c.)=	448,400	=($2,242,000).
" D to C.—	2,200,000	" "	" .04 (20c.)=	88,000	=($440,000).
" C to B.—	2,352,000	" "	" .10 (50c.)=	235,200	=($1,176,000).
" B to A.—	1,500,000	" "	" .04 (20c.)=	60.000	=($300,000).
Total....	22,906,000	" "	"£.58 (29c.)=	£1,326,400	=($6,632,000).

FIFTH and SIXTH. *Masonry Works.* The masonry works are needed for regulation, and for the accommodation of existing works.

1. *The Bahr Jūsuf Crossing and Reservoir Regulator.* This can be built on the limestone rock with a 40 metre wide platform, and a 2.5 metre depth of masonry, the levels of the canals will allow of a level crossing.

40' openings.....	at £1,500 =	£60,000 =	$300,000
Wing walls.....		10,000 =	$50,000
2,000 square metres regulating gates.....	at £9. =	18,000 =	$90,000
Total.....		£88,000 =	$440,000

2. *The Sugar Railway* will be diverted to the government railway bridge at a cost of £20,000 ($100,000).

3. *The Ibrahimia Canal* will be syphoned under the reservoir canal. The discharge to be passed is 3,000,000 cubic metres per day, and allowing a head and velocity of 2 metres per second, 8 pipes of 1.5 metres diameter will take the water across.

Estimate 8 pipes.....at £3,000 = £24,000 ($120,000), 300 tons + masonry.

4. *The Government Railway.* 4 feet 8½ inch gauge, 80 metres wide canal. Tons of iron, 1,500 at £25.; £37,000 ($185,000). With the work can be combined the regulating head of the reservoir canal, eighteen openings of 5 metres at £2,500 ($12,500)=£45,000 ($225,000).

Railway Bridge	£37,500	($187,500)
Regulator	£45,000	($225,000)
Total	£82,500	($412,500)

The masonry works therefore, will amount to

Bahr Jûsuf Crossing and Regulator	£ 88,000	($440,000)
Sugar Railway Diversion	20,000	($100,000)
Ibrahamia Canal Syphon	24,000	($120,000)
Head Regulator and Railway Bridge	82,500	($412,500)
Total	£214,500	($1,072,500)

The whole of the earthwork and masonry works will therefore (according to Mr. Willcocks) amount to

Earthwork	£ 1,326,500	($6,632,500)
Masonry	214,500	($1,072 500)
Land, 1,600 acres at £30 ($150.)	48,000	($ 240,000)
Total	£1,589,000	($7,945,000)

It will be a matter of interest to all those concerned in irrigation works to study these estimates, but no American engineer would, for a moment, admit that they furnish a basis upon which contracts could be let to the advantage of the government. The difference

between the method of constructing American and Indian railways is exhibited in the excessive allowances for work which could never be required.

Mr. Willcocks is not only an engineer of great ability and indefatigable energy, but deservedly enjoys the reputation of a readiness to adapt his plans to circumstances, in a manner characteristic rather of the United States than of Great Britain. His field work would be very different from his plans on paper. Availing himself of the tremendous velocity obtainable through the Lulu and Safir basins and the rapid slope of over 150 feet into the Raiyān depression much of the excavation would be accomplished by natural forces.

The Raiyān Works proper commence at the Bahr Jūsuf, and the western (desert) edge of the Nile Valley. Former estimates of £500,000 ($2,500,000) would not be exceeded. The great canal across the Nile Valley from Biba would in reality be a broad shallow basin cultivable once a year throughout its entire area. The masonry works may be taken as reasonable, but a part of the money would be otherwise expended. The total cost, therefore, of the Raiyān Project should be estimated thus:

Raiyān Canal of Escape, and Supply	$2,500,000
Works in the Nile Valley	1,500,000
Total, (£800,000)	$4,000,000

SEVENTH. *Quantity of Water capable of being utilized (without pumping). Time of filling Reservoir.* It appears (from Mr. Willcocks' tables) that for forty days each flood a depth of water of 8 metres (25 feet) may be taken into the canal, for twenty days the basins above the canal may be discharged into the canal

through the Bahr Jūsuf, for the thirty days of November a depth of 6 metres of water may be counted on, for December a mean depth of 4.5 metres, for January a depth of 3.0 metres, and for February of 2 metres. With an 80-metre wide canal, slope $\frac{1}{20,000}$, the (daily) discharges are:

8.0 metres depth	67,000,000
6.0 " "	42,000,000
4.5 " "	25,000,000
3.0 " "	13.000,000
2.0 " "	6,000,000

Therefore the supply obtained per annum would be:

September and October	60×67,000,000=4,020,000,000	cubic metres.	
November	30×42,000,000=1,260,000,000	"	"
December	30×25,000,000= 750,000,000	"	"
January	30×13,000,000= 390,000,000	"	"
February	30× 6,000,000= 180,000,000	"	"
March, from Bahr Jūsuf	30× 5,000,000= 150,000,000	"	"
Per annum,	6,750,000,000	"	"

Referring to the table of contents of the Raiyān depression, and allowing for evaporation and absorption, it appears that:

	Metres above sea.	Contents cubic metres.
At the end of the first year the water in the lake would rise to	+ 2=	6,750,000,000
" " second " " " "	+17=	12,892,100,000
" " third " " " "	+27=	18,566,760,000

In other words, the lake would be filled to the level +27 metres (above sea), or about 5 metres (16 feet) above low Nile at the end of the third year. It could give a half supply that year. The fourth year the lake would be in full working order and could be filled to +28 metres. Allowing 1 metre as loss by evaporation from April 1st to July 31st (an excessive estimate), the water in the reservoir could be utilized (without pump-

ing, either to fill or empty,) to the depth of 2 metres, *i. e.*, a stratum of water of 1,263,920,000 cubic metres, or a discharge of 12,639,200 c.m. per day (about 3,000 million gallons for 100 days.) This amount would flow back into the (Nile) canal through the reservoir canal as levels would suit. There are years when the lake could be filled to R. L. 29.0 or R. L. 30.0, but above R. L. +28 could not ordinarily be counted on.

It is obvious that Mr. Willcocks does not mean to limit the available portion of the 20,000 million cubic metres stored in the Raiyān Reservoir to little more than one-tenth. The water is to be consumed at all levels above the Mediterranean on its way to Alexandria, Port Said or Suez, and even slightly below the level of the sea on the bed of Lake Abūkir. A straight, clear channel past the pyramids, connecting with the Alexandrian canals, would lower the lake another 5 metres without artificial means.

EIGHTH AND NINTH. *The Quality of the Water, and its effect on the summer water of the Nile.* Mr. Willcocks quotes at length from the report of a meeting of the Khedivial Geographical Society, March 16th, 1888, in which this and kindred points were fully discussed.

Pierre Bey, engineer-in-chief of the *Compagnie des Eaux du Caire*, inquired whether there was any danger of infiltration into the Fayoum. M. Lieurnur, engineer-in-chief of the expedition of 1888, responded, and pointed out that it was definitely settled that the two depressions are everywhere separated by broad and solid strata of rock, except at two narrow passes of inconsiderable width, and little below the level of high Nile. In answer to a second question, whether the lake

might lose a part of its contents by infiltration towards the Mediterranean, he said that as the Raiyān and Fayoum basins, although 40 metres below the sea, have no infiltration into them, such a risk could not be considered as within the range of possibility.

It may be added that the silt-charged waters of the Nile speedily fill interstices and thus canals and embankments puddle themselves.

Salem Pasha (the largest landed proprietor in the Gharaq district) desired to know whether the water might not be impregnated with salt. Mr. Cope Whitehouse replied that this subject had been attentively considered, and that the unanimous conclusion of the officials in the Irrigation Department, as well as the native chief-engineers, whom he had taken pains to consult, was in the negative. There is salt in the Raiyān basin as everywhere else in Egypt, on the tops of its hills and in the soil of its fields. A shallow lake would be brackish. The Birket el-Qerūn when low is quite brackish. It contains all the salt which has passed into the Fayoum for countless ages, from a pre-historic period, concentrated from a surface of 1,250 square miles into a comparatively small area with a depth of only 8 metres (25 feet). Whenever this lake has attained a greater depth the upper stratum has become quite fresh, as evidenced by the remains of shell-fish. Even now the upper stratum can be used to drink; he had often so used it for several days at a time. The bed of the Raiyān basin contains in certain places small saline deposits. The pools formed in the lowest parts would be brackish until they had attained a certain depth. When the lake had been filled to a depth of,

say, 20 metres, the water would be quite fresh. The large quantity added and withdrawn each year would also tend to change the whole volume, while any percentage of salt absorbed would be infinitesimal, and of no possible importance in relation to either agriculture or its use in drinking.

Dr. Schweinfurth was inclined to think that the Raiyān depression could be more advantageously treated like the Fayoum, and used as an additional cultivated area. He repeated the fear that the water might become salt.

Mr. Cope Whitehouse said, in reply, that the difference between 80,000 (Egyptian) acres, cultivated once a year, and (not less than) 2,300,000 acres of *sefi* (summer) cultivation was in itself a reason why the reservoir scheme must be considered preferable, if feasible. In any event there is no risk incurred. Long before any part of the water which had been poured into the Raiyān basin could be discharged again into the Nile, the problem would have received a practical and final solution. If the water proved unfit for use, the canal would nevertheless have paid for itself as a flood escape, and as an irrigation canal for the Raiyān district. He might also say that if the Raiyān basin was the Lake Moeris of the Ptolemaïc maps, we have the experience of 2,000 years to put against a conjectured possibility. He would, however, ask the Inspector-General of Irrigation for his opinion.

Major (now Lieut.-Colonel) Ross—who was received with warm applause—said that he entertained no apprehensions in regard to the purity of the waters and explained his reasons at length.

He wished to add in respect to the amount of land

which could be cultivated by this reservoir that Mr. Cope Whitehouse had confined himself to the Delta. If twenty million cubic metres of water, per diem, could be added to the summer supply, it would enable the Department of Public Works to increase the amount now allotted to the cultivation of Upper Egypt. There is also a large area in the plain near Kom Ombos, which, by the scheme recommended by Mr. de la Motte, would be converted into a storage reservoir. It is excellent land and can be easily irrigated. *Sefi* cultivation might be largely extended in the provinces of Minieh and Beni-Suef. Cultivation in the Fayoum could also be increased. The Government would not be obliged to economize its water supply in Upper Egypt, because the Delta would obtain a part of its normal, as well as an additional, supply from the Raiyān reservoir. Another ten million cubic metres of daily supply would also go far to put a stop to corruption in the Delta. The strain upon the honesty of the local officials, when offered a bribe for a few hours' more water, is very great, and sometimes irresistible.

Mr. Lieurnur confirmed what had been said by Major Ross in regard to salt. In accordance with his instructions he had sunk experimental wells all over the basin, and had not found salt except in insignificant quantity. The bottom of the basin is rock, covered with clay and drifted sand hills.

On this point it may be added that it is much to be regretted that Dr. Schweinfurth should have given expression to a doubt on this subject. The question was subsequently examined by Osman Bey Ghalib and Dr. Seckenberger, and they agree with Colonel Ross

and all other experts. No project has probably ever met with such universal favor as this Raiyān scheme. Thousands of engineers, American, Egyptian, English, French and German have had an opportunity of studying it. The most eminent men have urged its immediate execution. Objections of a somewhat similar character, transmitted through Sir E. Baring—British Agent and Consul-General—to the Foreign Office, have contributed materially to delay the actual completion of the work. "The purpose of the government," says Herodotus, "in constructing this reservoir was to supply (good) Nile water to the inhabitants of the towns not lying upon the (main branches of) the river; for previously they had been obliged after the subsidence of the flood (as at present) to drink a brackish water which they obtained from the wells."

TENTH. *Passage of the Raiyān Water Through the Canals of Lower Egypt.* The canals taking off from above the Barrage will be capable of utilizing the following discharges at R. L. 14 metres on the Barrage, which is the maximum gauge to which water is to be held up in summer:

	Cubic metres.
Behêra	8,000,000 per day
Menoufieh and Gharbieh	16,000,000 " "
Dakalia, Sharkia and Kalubia	20,000,000
Total	44,000,000

Since the *mean* summer discharge of the Nile at Cairo is 34,000,000 cubic metres per day, and the reservoir can supply at least 12,000,000 per day in summer, the existing canals will (to that extent) suffice.

ELEVENTH. *The Lands to be Reclaimed near the Sea* will have to be provided with canals and drains. An

expenditure of £2 ($10.00) per acre on the land to be reclaimed must be considered in all estimates of cost of reclamation, in addition to the water supply in summer. The winter supply will have to be provided against also in some of the provinces.

TWELFTH. *Cost of the Project and Time Required.* Mr. Willcocks estimates the cost at £1,589,000, *if everything has to be done thoroughly.* The canal will, he thinks, take three years to complete if machinery is freely employed; and the reservoir will take three years to fill.

Prime cost.....	£1,589,000	($7,945,000)
Interest at 5 per cent. for six years....	476,000	($2,380,000)
Total cost, including interest.....	£2,065,000	($10,328,000)

How can interest be calculated on the entire total cost for the three years in which the works are in progress? The interest the *first* year would not be £10,000, and the ordinary deferred payments to the contractors would still further effect material reduction.

The Manchester Ship-Canal has established a rate of excavation and earthwork which would enable a contractor of equal energy to open the canal of escape in a single year. It would immediately begin to earn the amount agreed upon as remuneration for this part of its duty. The small basin, the Lulu Reservoir, would be also available for storage, and a crop grown on the plateaux of the Raiyān depression wherever water lodged for over ten days.

The masonry works would not be required until the third year after the escape canal had been completed, and it would be inexpedient to undertake them until after the escape had been worked. Official estimates

are influenced by precisely the opposite calculations to those which induce the capitalist to add fifty per cent. to the figures of an ordinary project. The British Government desires to increase the Egyptian debt, without guaranteeing either principal or interest. It has been proposed to use the Raiyān project to influence the Great Powers. The liberty to borrow a large sum would be convenient. If the works were executed for half the estimates there would be so much more to the credit of the Irrigation Department.

Mr. Willcocks concedes that, by carefully selecting the site of the canal, and economizing in the hill slopes, the total cost (of the completed works) might be reduced to £1,800,000 ($9,000,000). The annual interest charge would then be, at five per cent., £90,000 per annum. Nothing is said about maintenance charges, probably because he considers them too insignificant.

This undertaking appears (to him) so vast, and the difficulty of insuring a return so great that no private company, except a guaranteed one, could undertake it. "As far as Egypt is concerned, however," he says, "the completion of this reservoir would permit of a *new province being formed in the north of Egypt*, and give an impetus to the reclamation of the waste land which would in the end have a marked effect on the revenues of the country. With flush irrigation in summer assured land could easily pay ten shillings ($2.50) per acre. With a canal of eighty metres in width a discharge of 12,000,000 cubic metres per day in summer can be guaranteed for £1,800,000 ($9,000,000). The interest on £1,800,000 at five per cent. per annum is £90,000, ($450,000) or £75 ($375) per million cubic metres

(400 feet a second). Twelve million cubic metres per day would suffice for 300,000 acres of rice, or 400,000 acres of rice and cotton combined. To reclaim 400,000 acres, it would be necessary to spend £2 ($10) per acre, or a capital of £800,000 ($4,000,000). A company, therefore, which received the concession of the Raiyān reservoir and 400,000 acres of land in the Birrīya (uncultivated Delta) would need a capital of £2,600,000 ($13,000,000). If the undertaking were successful a net profit of fifteen per cent. might be obtained, but the company would always be at the mercy of the Government."

It seemed better to give the summary of the projected restoration of the Raiyān Moeris (as far as possible) in the words of Mr. Willcocks. Everything that he concedes in its favor is clearly to be accepted as the official admission of men of marked ability, enjoying every opportunity of arriving at correct results. In the opinion of the Hon. John Cardwell, late Consul-General of the United States, himself a warm sympathizer in my efforts, the project was reluctantly examined with the expectation and hope that it might easily be exposed as a delusion.

No capitalists, of course, would raise the money in the form contemplated by Mr. Willcocks. The money required for canals and drains in the Delta could be obtained from local enterprise. No guaranty would be required from the Government except an undertaking to allow water to flow in and out of the canal, at certain stages of the river, and to pay, at a fixed rate per million cubic metres, for the benefits thus conferred.

Sir C. C. Scott-Moncrieff is in this dilemma. If he

advises the Egyptian Government to solicit from the Great Powers the right to increase the indebtedness of Egypt, he pledges his position and reputation to the absolute certainty of the enterprise. He knows that every penny wrung from the peasant is a hardship, and that the power of Egypt to borrow at between four and five per cent. would be seriously strained by the unprofitable use of any such sum of money as £2,000,000. Taking only the absurdly small estimate of £6,000,000 ($30,000,000) as the total cash value of the Raiyān Reservoir, Mr. Willcocks estimates my gift to Egypt at £4,000,000 ($20,000,000); the actual value, of course, with skillful management, would approach £100,000,000 ($500,000,000).

If, on the other hand, there is any risk, what is it? What is its value in terms of enhanced interest or prospective profits offered to the capitalist? Let Sir C. C. Scott-Moncrieff draw up the terms of a concession, or modify those already submitted. They embraced the alternative of lending the Government the necessary funds, without a guaranty, on participation in net earnings, or of completing the works in one-half the time, and at one-half the cost on which Mr. Willcocks would earn fifteen per cent. and Sir C. C. Scott-Moncrieff concedes ten per cent. It may be observed that no allowance is ever made for any remuneration to the discoverer, inventor, or advocate of the Raiyān project.

Vastness is no attribute of the engineering works detailed by Mr. Willcocks. The original scheme, including the conversion of the Fayoum into a fertile province, with its borders and approaches crowned with pyramids and a pyramid-hill where it was deepest, a canal—a river,

not a stagnant ditch—from Assiūt to Alexandria, fit channel for Indo-Mediterranean commerce, passing at the foot of Memphis, a throne of empire, was vast in every sense of the term. Some elements of the sublime might be thought to attach to the pursuit of the True, the Beautiful, and the Good—the defense of the dead from aspersion, and of the living from pestilence and famine. The removal of some millions of baskets of earth is literally child's work.

"In spite of much ridicule and some opposition," writes Mr. Moberly Bell, "Mr. Cope Whitehouse has held to his project with all the tenacity of an enthusiast and has now the well-earned reward of seeing his scheme regarded as practicable and profitable by men whose judgments cannot lie under the suspicion of being influenced by the poetical enthusiasm of the student who originated them. It is probable that if he had appeared in Egypt as the mercenary would-be promoter of a simple commercial enterprise his views would from the first have received more serious consideration. It is, however, at least equally probable that they would not have achieved the same success. He may now be fairly congratulated on having proved the practicability of a scheme which was by many regarded as the dream of the visionary enthusiast."

Sir Edgar Vincent, as Financial Adviser to the Khedive, in his memorandum on the subject (1888) said: "If, after the Barrage has been working for three or four years, it is found that an increased supply of water is required and can be dealt with, the scheme of Mr. Cope Whitehouse will become a valuable instrument for the agricultural development of Egypt. If it were possible to

make the scheme entirely self-supporting by granting Mr. Cope Whitehouse, for a term of years, certain barren lands which his reservoir would render cultivable, such a proposal would have my hearty support." He added with generous courtesy: "I cannot conclude this memorandum without expressing my high sense of the intelligence and perseverance with which Mr. Cope Whitehouse has pursued the realization of his object."

Sir Julian Pauncefote, as permanent Under-Secretary of State for Foreign Affairs, on January 12th, 1889, wrote: "With reference to my letter of the 13th of August last, and to previous correspondence respecting your scheme for the creation of a large reservoir in the Raiyān basin for the storage of Nile water for irrigation purposes, I am directed by the Marquis of Salisbury to inform you that Her Majesty's Agent and Consul-General at Cairo (Sir Evelyn Baring) has received a note from the Egyptian Minister for Foreign Affairs (Zulfikar Pasha) stating that the project has been carefully examined by the Egyptian Government, but that after full consideration they have come to the conclusion that they cannot adopt your proposals, while the benefits which might accrue from their adoption are fully acknowledged. I am to add that Her Majesty's Agent and Consul-General, while regretting that Egypt is not able to profit by the execution of the project which you have prepared with so much care and skill, states that he has satisfied himself that the project has been considered with the greatest care and attention by Sir C. C. Scott-Moncrieff and Colonel Ross, who, as you are aware, are the responsible advisers of the Khedivial Government in such matters."

The Raiyān project, then, is in "a complete and perfect state" (Willcocks, p. 322). The Khedive, as befits the ruler of Egypt, displays that disposition to further its execution, which his judgment, tact and practical acquaintance with the needs of his people approve. The native officials and the inhabitants co-operate. The British Government assumes all the responsibility for the delay, basing the attitude on the recommendations of its representative. Sir Evelyn Baring has authorized me to make public his personal recognition of the value of the work, and expression of regret that circumstances should not permit it to proceed as rapidly as seems to me desirable.

Lord Salisbury has given the subject some attention, but whether from recondite motives of profound policy, or influenced by the qualified, and in some respects erroneous, information laid before him, this most able of Foreign Secretaries has not allowed his hand to close upon the powerful weapon which has for some time been well within his reach.

Mr. Gladstone, with his keen love of Hellenic literature, has thrice sought occasion to offer words of encouragement and commendation. On both sides of the House of Commons, but especially from the Liberal side, assurances have been given that this question would never be treated as political.

The King of the Belgians early manifested a personal interest, expressed in terms which were flattering in the extreme.

The French Government, also, I am credibly informed, would further the project as tending to improve the state of Egypt, without regard to purely political considerations.

If, as Sir Samuel Baker points out in the *Fortnightly Review*, October, 1889, every river tributary to the Nile should be controlled by weirs, or dams of masonry, "the scheme for the restoration of Lake Moeris (in the Raiyān depression) as the great reservoir of the Nile, proposed by Mr. Cope Whitehouse for the security of Lower Egypt, would be accomplished as a natural result of engineering science, which had bridled the untrained jaws of Egypt's river, and guided its course to the service of mankind." A true Fountain of the Sun, it would bring Light and Life to the heart of Africa. It would once more challenge the admiration and esteem of the world for those who thought that by such great works they reared an imperishable memorial to attest the splendor of noble purpose when applied to guide and restrain the capricious hand of Nature for the health and wealth of the distressed inhabitants of the Valley of the Nile.

NOTE.—The author of this paper is not responsible for the spelling of the names in quotations, or on the maps and cuts reproduced.

GEOGRAPHICAL NOTES.

THE INTERNATIONAL GEOGRAPHICAL CONGRESS.—The International Geographical Congress met in Paris on the 5th of August, and closed its sittings on the evening of the 10th with a banquet. The opening address was made by M. de Lesseps, President of the Paris Geographical Society, and the different Sections then entered upon their work, which is fully reported, in the order of the classification adopted, by *La Géographie*.

In the Mathematical Section a communication was received from M. Lallemand, mining engineer, on the subject of a zero for altitudes in Europe. He showed that, according to the results of the new survey of France, the difference of level between the Mediterranean and the Ocean was but from 1 to 2 decimetres (.3281 to .6562 of a foot) instead of 1 metre (3.2809 feet) as previously supposed; and he thought it would be well to establish a mean level for each country before deciding upon a fundamental horizon. M. Lallemand dwelt also on the necessity of correcting the surveys operated in mountainous regions by taking into account the influence of the variations in gravity. M. Defforges pursued the subject with a detailed criticism of the methods and the instruments employed during the past century, and on his motion the Section adopted a programme of observations to be applied to the determination of variations in gravity resulting from elevation.

There were discussions on the observation of ocean currents and especially those of the North Atlantic, the advantages of the decimal division of time, and the proposition of Father Tondini, delegate of the Bolognese Academy of Sciences, for the adoption of the meridian of Jerusalem as the initial meridian for longitudes, as well as for the universal hour. This proposition, with which Father Tondini's name has long been identified, has received the support of many competent authorities, among others, of Dr. Supan. One argument in its favor is, that, Jerusalem being for Christians and Mohammedans as well as for Jews a holy city, the selection of that meridian would recommend itself to all mankind; unless, indeed, it were thought proper to include among men the inhabitants of Eastern Asia and some other parts.

It must be admitted that the choice of Jerusalem would put an end to national rivalry for the possession of the prime meridian, and France, at least, would find some compensation for giving up her own preference in the establishment, delicately suggested by the President of the Bolognese Academy, of an observatory on the "anti-meridian of Jerusalem" in Tahanea, one of the islands in the French Archipelago of Tuamotu. On the final question there were twelve votes for, and twelve votes against, Father Tondini's proposition, and this result probably settles the matter.

An ideally perfect meridian were an excellent thing, if it could be had, but most persons will agree with General Kaulbars that, while one meridian is intrinsically as good as another, that of Greenwich is to be preferred. Months, like meridians, are part of the machinery of

life, and it does not seem to distress the logical mind of Father Tondini that he is obliged to designate the tenth month of the year by the name of October.

In the Section of Physical Geography the Japanese delegate, Mr. Wada, read a paper on the organization of seismological research in Japan, M. de Saussure gave a sketch of what Switzerland was doing in the same line, and Baron von Schwerin presented a report on his explorations of the country at the mouth of the Congo and on the western coast of Africa. Through the whole extent of this region the sea is retreating and the land is rising; the rains are less and less frequent and the soil dries up and contracts, and there ensues a sinking in of the continental mass upon itself along the coast.

M. Turquan presented to the Section of Economical and Statistical Geography a work on the immigration of foreigners into France and the emigration of Frenchmen to foreign countries. Other works presented were: one by General Kaulbars on geographical achievement in Russia, and one on emigration by M. Metzger. With regard to the destruction of forests, the Section, speaking for the Congress, unanimously voted a resolution that shows a lack of faith in the unassisted efforts of kindly Nature. "The Congress, considering that the disappearance of woods from the surface of the soil produces and will produce consequences the most disastrous from every point of view, physical, economical and meteorological, expresses the hope that the nations, which still have the good fortune to possess the forest growth that protects the soil, will make every effort to preserve it, and that the others, whose forests are

already endangered, will take the most active and efficacious measures for their re-establishment."

The Section expressed also its interest in the aims and objects of the International Marine Conference at Washington, as well as its desire to see the works for the canalization of the Seine pushed to completion, so as to permit vessels drawing 19 to 20 feet of water to ascend the river to Paris.

In the Section of Historical Geography memoirs were received from M. du Paty de Clam on the ethnography and geography of the Gulf of Gabes, and from M. Marcel on Ottavio Pisani. M. Marcel gave also some information concerning a manuscript globe, attributed to Schöner, and now in the National Library. Father Brucker read a paper on the maps constructed by the Jesuits in China. M. Castonnet des Fosses gave a history of the commerce of Nantes with Spain, Flanders and Bremen, and sketched the relations of the Chinese Empire with the Greeks and Romans.

Abbate Pasha, President of the Khedivial Geographical Society, presented his views on the position occupied by the Negroes (the *Kush* of the inscriptions) among the Egyptians of the Pharaonic epoch. He called attention also to a remarkable paper on the Egyptian *stadium* by Mahmud-Bey, and to the fact that recent explorations had revealed numerous traces of vineyards in Egypt; and he believed that the culture of the vine in that country had been suddenly interrupted by the Mohammedan conquest.

M. Ludovic Drapeyron gave an account of the first national Atlas of France, dated in 1592; and M. Rouire spoke on the site of Lake Tritonis.

Baron von Schwerin read for the author, Mr. Dahlgren, a paper on the voyages of the Brothers Zeno. The Swedish author regards the Zeno map as a compilation of earlier maps and charts. M. Pector spoke on the historians who have mentioned Nicaragua, and M. Pawinski read a memoir on the scientific method applied to historical geography, illustrated by his own work on Poland. M. Eeckman presented M. Caron's memoir on the Roman mines in Tunisia and their utilization by the French. Colonel Coello, Honorary President of the Madrid Geographical Society, described very fully the Roman roads of Spain. The last act of the Section was to approve M. Jackson's proposition that "a biographical dictionary of travellers be prepared in each country." Beyond this approval the Congress could not go; and the task of setting each nation to work upon its dictionary naturally falls to M. Jackson.

The Didactic Section recommended the introduction of ethnography into the higher course, and the creation of special professorships of geography.

The Section of Voyages and Explorations unanimously declared "that the explorer in a new country has no right to bestow names unless there are no native inhabitants." This declaration should command the assent and the support of every enlightened geographer.

Communications were made by M. Masqueray, on the Tuaregs; by Count Cavalcanti, on the Paramanema River, on the cannibals of Brazil, and on the tribes of the Xingú; by Mr. Timmerman, on the Sunda Islands, and by Dr. Kan on the Moluccas; by M. Leclercq, on the monuments of Samarkand; by M. Sarrea Prado, on

the roads in the Portuguese colonies; and by M. Gauthiot, on the labors of the French expedition in Upper Laos. Colonel Coello announced that there would be held in Spain in 1892 a Spanish-American Exhibition. Mr. Cordeiro, of the Lisbon Geographical Society, presented a collection of maps and charts destined for the library of the Paris Society.

In the Anthropological and Ethnographical Section, Dr. Riedel read a paper on the natives of Rotti, in Netherlands-India. Dr. Hamy made a report on explorations undertaken by himself and M. de la Croix in southern Tunisia, and M. Charles Rabot described his observations among the Lapps and Fins of Russia. General Venukoff presented an important work on the Kirghiz, by General Grodekoff, and Dr. Maurel spoke on the origin of the Cambodian peoples. M. Capus described the country and the manners of the little-known Kafirs, of Central Asia, their language and their relation to the other ethnic elements of Asia. Prof. Waldemar Schmidt called the attention of the Section to the very full anthropological gallery in the Danish department at the Exposition. This gallery represented, he said, the present state of our knowledge with regard to the prehistoric age in Denmark.

At the general sessions of the Congress, held from time to time, there were many interesting papers read and addresses made. Mr. Lessar, Russian Consul at Liverpool, treated the subject of the changes in the bed of the Amu-Daria. M. Martel reported his observations in the exploration of the subterranean watercourses in the region of Les Causses. The ice-grottoes of the Jura were described by M. Ch. Faure, and those

of the Crimea by Mr. Grigorieff. Mr. Waldemar Schmidt summarized the experiences of Mr. Nansen in his perilous journey across Greenland, and Dr. Hamy read and commented upon a paper by Mr. Carl Lumholtz, the delegate from Norway, on the present and the future of Queensland. M. J. Borelli, recently returned from Abyssinia, gave an account of his travels in the Galla country. In reply to a question put by M. Savorgnan de Brazza, M. Borelli expressed the opinion that, while the Abyssinians were unable to make conquests beyond their own limits, they were strong enough to resist a Mohammedan invasion. Mr. Maurice Déchy, delegate of the Buda-Pest Geographical Society, read a paper on the central chain of the Caucasus. The southern slopes of the range, he said, were steeper than the northern, at least, in the central chain; but those of his hearers, who were acquainted with the ground, did not seem to agree with him, and M. Venukoff thought it better to avoid generalization on the subject. At the closing session on the 10th of August, Mr. Von Höhnel entertained the Congress with the story of his journey to Mt. Kilimanjaro.

It is to be hoped that the precedent of delay in the publication of the full Report of Proceedings, established by previous International Congresses, will not be followed in the case of the one just held. The Antwerp Congress of 1871 issued the closing volume of its Report in 1872; but the Paris Congress of 1875 delayed its final volume until 1880, and it was not till 1884 that the publication of the proceedings at the Third International Congress, held at Venice in 1881, was completed.

THE TELEGRAPH CABLES OF THE WORLD.—Dr. A. Supan shows, in *Petermanns Mitteilungen, Band 35, IX,* the successive development of the telegraph-cable system from 1851 to 1888:

	Government Lines.	Private Companies.	Total.
	Length in Nautical Miles.		
1851–1868	1330	14500	15830
1869–1878	2400	52922	55322
1879–1888	6754	47094	53848
1851–1888	10484	114516	125000
In English miles,	12085.25	132006.37	144191.62

Except in the Persian Gulf, most of the cables laid before 1869 have been lost, and the actual length of working lines in the world is 113,038 nautical= 130,302.63 English miles. Of these 11,626 nautical miles are under Government administration (France possessing 3,197), and 101,412 nautical miles are in the hands of private companies, the most important being the Eastern Telegraph Company, with 18,838 miles, the Eastern Extension Australasian and China Telegraph Company with 12,035 miles, and the Anglo-American Telegraph Company with 10,438 miles.

MT. ST. ELIAS.—On pages 433–434 of the *Proceedings* of the Royal Geographical Society, for July, 1889, is a note from Mr. H. W. Seton-Karr, who attached himself to the Schwatka expedition to Alaska in 1886. Mr. Seton-Karr writes that when he returned to San Francisco from Alaska he was informed by the newspaper editors that any statement questioning the claim of the United States to Mount St. Elias would inflict an injury upon their reputation, and that he was, therefore, compelled to say nothing about it. He did well to keep

silence, for there is not a more fearful wild-fowl than your San Francisco editor, when he catches sight of a Briton making off with Mount St. Elias. The traveller survived to reach

> The land where, girt with friends or foes,
> A man may speak the thing he will;

and devoted, as he must be, to the cause of truth even more than to the acquisition of mountains, he cannot but have read with pleasure, in the *Proceedings* for October, the following correction of several misstatements that slipped in among the things he willed to speak at a distance from San Francisco:

SUB-OFFICE, U. S. COAST AND GEODETIC SURVEY,
SAN FRANCISCO, CALIFORNIA,
August 6, 1889.

DEAR SIR: I beg to call your attention to the remarks of Mr. H. W. Seton-Karr upon the geographical position of Mount St. Elias, Alaska, on pp. 433, 434, of vol. xi. No. 7, New Monthly Series of the "Proceedings of the Royal Geographical Society," July, 1889.

As my name has been brought into the matter by Mr. Seton-Karr, I quote a part of his remarks:

"In 1874 the U. S. Coast Survey observed a series of vertical angles from Yakutat, about sixty miles distant, on Mount St. Elias. Their triangulation fixed the position of the mountain as lat. 60° 22′ 06″, and long. 140° 54′ 00″, or within six minutes of the boundary. This position was incorporated in Professor Davidson's 'Coast Pilot of Alaska,' he being the head of the Coast and Geodetic Survey. As I believe these were the only observations taken, and as there have been no later ones, it requires to be explained why the position of St. Elias was subsequently shifted. In the next edition of this volume, which is called 'The Pacific Coast Pilot,' and bears the date 1883, Mount St. Elias is forced to make a fresh jump, and this time clear over the boundary. This new position, for which no reasons are given, is lat. 60° 20′ 45″ N., and long. 141° 00′ 12″, or just 12 seconds over the line, and —needless to say—on the American side."

This extract contains several misstatements. I remark:

The title of the "Coast Pilot of Alaska," which I wrote in 1867-69, and of which I gave Mr. Seton-Karr a copy, is "United States Coast Survey, Benjamin Pierce, Superintendent. Pacific Coast. Coast Pilot of Alaska (first part) from Southern Boundary to Cook's Inlet. By George Davidson, Assistant Coast Survey, 1869. Washington, Government Printing office, 1869." This title shows: 1st, that the

work was published in 1869; 2d, that I was not the head of the Coast and Geodetic Survey; 3d, upon consulting the new edition, you will see that I am not the author of the latter.

An examination of my work of 1869 establishes the fact that on p. 62 I gave the geographical position of the mountain as "lat. 60° 22′ 6″, and long. 140° 54″, in the tabulation of geographical positions on p. 206, I repeat the above; and in the column of authorities I note "Vancouver, Tebenkoff's Atlas."

In 1874 Acting-Assistant Dall made a rough reconnaissance of that region, and his report is given in full in the annual report of the Superintendent for the year 1875. On p. 182, there is exhibited in detail the "Determination of position of Mount St. Elias" as follows; lat. 60° 20′ 45″, long. 141° 00′ 12″.

This further shows: 4th, Mr. Seton-Karr erroneously ascribes the data which were published in 1869, to the year 1874; 5th, he does not even quote the data properly, and unqualifiedly asserts that these are the only observations that have been taken and that there are no later ones; 6th, that to prove his case he was obliged to make the ungenerous insinuation that the observations had been tampered with.

There is much that I might say about that expedition and Mr. Seton-Karr's crochet to have Mount St. Elias in British territory; but what I have herein shown is a fair sample of all the rest.

GEORGE DAVIDSON,
President of the Geographical
Society of the Pacific.

The Assistant-Secretary R. G. S.

RAILWAY MILEAGE IN THE UNITED STATES.—The first annual Report on Statistics of Railways in the United States, to the Interstate Commerce Commission, gives the following figures for the railway mileage of the country on the 30th of June, 1888.

The total length was 149,901.72 miles. Of these Illinois possessed 9,708, Kansas 8,437, Iowa 8,230, Pennsylvania 7,992, Texas 7,902, Ohio 7,523, New York 7,488, Michigan 6,346, Indiana 5,723, Missouri 5,711, Wisconsin 5,057, Minnesota 5,032, Nebraska 4,900, Dakota 4,293, California 3,713, Colorado 3,676, Georgia 3,596, Alabama 2,833, Virginia 2,777, Tennessee 2,477, North Carolina 2,433, Kentucky 2,294, Florida 2,147, Mississippi 2,118, Massachusetts 2,082, Arkansas 2,030, New Jersey 1,914, South Carolina 1,880, Montana 1,712,

Louisiana 1,501, New Mexico 1,313, Oregon 1,312, West Virginia 1,216, Maine 1,206, Maryland 1,126, Utah 1,122, New Hampshire 1,070, Arizona 1,061, Connecticut 999, Washington 986, Vermont 946, Nevada 914, Indian Territory 879, Wyoming 863, Idaho 807, Delaware 313, Rhode Island, 214, and the District of Columbia 31.

Comparing the railway extension with the area of each division, the District of Columbia stands first with 2.29 square miles to each mile of road. Massachusetts counts 3.99 square miles, New Jersey 4.08, Connecticut 4.91, Ohio 5.45, Pennsylvania 5.65, Illinois and Rhode Island, each, 5.83, Indiana 6.35, Delaware 6.55, New York 6.56, Iowa 6.80, New Hampshire 8.69, Michigan 9.28, Kansas 9.72, Vermont 10.10, Maryland 10.84, Wisconsin 11.08, Missouri 12.15, Virginia 15.29, Nebraska 15.68, South Carolina 16.25, Georgia 16.54, Minnesota 16.57, Tennessee 16.97, Kentucky 17.61, Alabama 18.44, West Virginia 20.38, North Carolina 21.48, Mississippi 22.10, Arkansas 26.53, Florida 27.33, Maine 27.41, Colorado 28.27, Louisiana 32.45, Texas 33.63, Dakota 34.73, California 42.64, Washington 70.18, Oregon, 73.21, Indian Territory 73.57, Utah 75.74, Montana 85.32, New Mexico 93.35, Idaho, 105.-14, Arizona 106.50, Wyoming 113.38, and Nevada 121,06. The proportion for the whole country, exclusive of Alaska, is 1 mile of railway to 20.14 square miles.

The Bay of San Francisco.—There appears in the *Proceedings* of the American Antiquarian Society of Worcester, Vol. VI., Part 1, a letter from Mr. John T.

Doyle, of Menlo Park, California, on the subject of the discovery of San Francisco Bay.

Mr. Doyle, in a public address, delivered at the Commencement of Santa Clara College in August, 1870, called attention to the statements in Crespí's diary as to the discovery of the bay; and in October, 1873, a memorandum of his on the same subject was presented to the American Antiquarian Society by Col. J. D. Washburn. In this memorandum Mr. Doyle expressed the opinion that the first civilized men who saw the Bay of San Francisco were the members of Portolá's expedition in 1769; and that what the Spaniards had down to that time called the Bay of San Francisco was what we now term Sir Francis Drake's Bay. In his letter of Nov. 24th he says that these opinions have lately received confirmation on contemporary authority, through the discovery, by Prof. George Davidson, of the U. S. Coast and Geodetic Survey, of Miguel Costanzo's map,* *Carta reducida del Océano Asiatico ó Mar del Sur, etc., 1771.* A tracing of this map was made by Professor Davidson and presented to the Worcester Society, which has courteously allowed its reproduction in this BULLETIN. It shows the "Puerto de S. Francisco," almost in the place of Drake's Bay, near the "Punta de los Reyes," and behind this the "Estero de S. Francisco" penetrating the land, and unmistakably designed to represent the Bay of San Francisco with its northern extensions.

Costanzo's map is sufficiently rare to be something of

* The title and descriptive note, quoted at length by Mr. Doyle, have suffered in the printing. *Gobierero* is easily corrected, but the words *con cido* and *sin al adamente* do not show at once that they are meant for *conocido* and *señaladamente.*

COSTANZO'S MAP OF THE CALIFORNIA COAST, 1771

a curiosity, but Professor Davidson does not claim to have discovered it. He says in a recent letter: "It

was no discovery in the strict sense of the term, for I found it in an old publication of Dalrymple's, about 1790, if I recollect rightly. I can refer to the volume when I reach home."

In closing his communication, Mr. Doyle calls attention to a passage in the text and a note in Bancroft's History of the Pacific States, Vol. XIII., p. 157. It is there said that Mr. Bancroft's assistant, "in the *Overland Monthly*, made known for the first time to the English reading public the statements of Cabrera Bueno and Crespí, and in a few brief notes put the subject (the question concerning San Francisco Bay) in its true light."

Mr. Doyle points out that the *Overland Monthly* article appeared in June, 1874, nearly four years after the first, and eight months after the second, of his own publications on the subject of Crespí's diary. These publications are quoted in Vol. XIII. of the History, pp. 141 and 156, and Mr. Doyle infers, not unreasonably, that Mr. Bancroft had become acquainted with them before his assistant enlightened the English reading public. In view of this acquaintance with Mr. Doyle's work, the assertion made on p. 157 can only have found its way into print during one of those flashes of forgetfulness, which sometimes overtake men burdened with great cares.

Climatology of Brazil.*—In the Rio *Revista do Observatorio*, Nos. 5, 6 and 7, Mr. H. Morize continues and finishes his sketch of the Brazilian climate.

At Recife (Pernambuco) the annual rainfall is nearly

* Bulletin, A. G. S., Vol. XXI., No. 2, p. 232.

119 inches, the heaviest precipitation being in June and the lightest in December. (The proportions, as printed, reverse the statement.)

At Victoria, 8° 9′ S. Lat., the mean temperature of the year is 77° Fahr., the hottest month being February, with 80° .06, and the coolest July, with 73° .4. South-east winds prevail during the rainy season, and easterly winds for the rest of the year.

The rainfall at this point and at Colonia Isabel is about 40 inches annually.

At Bahia the mean temperature of the year is 79°, the extremes being 88° and 70°. The greatest heat is felt from December to March, but rarely exceeds 83°, while the average of the cool months of June, July and August is 75°. Rain is frequent, particularly in March, April, May and June, and again in October and November, and the annual fall amounts to 85 inches. The prevailing wind is the south-east, from April to September, and the north-east for the rest of the year.

The southern portion of Bahia and the provinces of Espirito Santo and Rio de Janeiro, with a part of the sea-coast of São Paulo and the eastern portion of Minas Geraes constitute the remainder of the sub-tropical zone. Not many observations have been made in Espirito Santo, but the mean temperature of the province is thought to be about 75° Fahr.

Rio de Janeiro possesses the most complete series of observations to be found in Brazil. The first of these were made in 1781 by the Jesuit Father Sanches Dorta; and after many interruptions at the beginning of the present century the series was taken up again with the creation of the Imperial Observatory, and has been con-

tinued without a break for thirty-seven years up to this day. According to these daily observations the mean annual temperature of Rio is 74° .3. The greatest heat is felt in January and February, 81° .5, and the lowest in July, 69° .4. The hottest year on record was 1868, with a mean of 75° .3, and the coolest 1882, with a mean of 72°. The hottest day was Nov. 25, 1883, when the mercury rose to 99° .5, and the coldest Sept. 1, 1882, when it went down to 50° .3.

In the hot season the heat increases from sunrise till the sea-breeze comes in from the S.S.E., between mid-day and 2 o'clock in the afternoon; but if from any cause the breeze dies away, the heat may rise to 86°.

The prevailing winds are alternately from the S.S.E. and the N.N.W. The former blow when the sun approaches the Tropic of Capricorn and with his passage towards the north the winds change to the N.N.W.

The rainy season at Rio is from November to April, and the yearly precipitation is 43 inches. Rain falls on 104 days in the year and thunder-storms occur on 29 days. Hail is rarely known. Father Sanches Dorta frequently noted in his journal the appearance of the Aurora Australis; but it has not been remarked at the Observatory.

The ancient Swiss settlement of Nova-Friburgo, which is situated 2′ to the E. of Rio, on a spur of the Serra de Macahé, enjoys, through its elevation of nearly 3,000 feet above the sea, a charming climate, with a mean annual temperature of 63°, an average heat in the hottest month, January, of 69° and a mean of 57° in July and August.

Queluz, in the province of Minas, stands somewhat

higher than Nova-Friburgo, and has much the same climate.

In the western part of the province of Minas a true continental climate is found at the little city of Uberaba, situated 2,500 feet above the sea. At this place, according to Father Germano d'Annecy, the mean temperature is 70° and the minimum 27°.5. This statement is confirmed by Martino, who declares that a fall of snow is nothing uncommon in the region, which is almost on the twentieth parallel; and also by Dr. J. Hann, who relates that in some places between Barbacena and Ouro Preto there was in June, 1870, a temperature of 26°, that lasted for five or six days, and that at Barbacena the thermometer marked 21°.

At the station of Cascata, S. Lat., 21° 33′, on the Serra de Caldas, between the provinces of Minas and S. Paulo, the variations of temperature are even more marked, the observations for 1884 showing 104° for January and 32° for June.

All the neighboring country shares this continental climate. At Ribeirão Preto, four degrees and a half to the W. of Rio, and elevated only 1,700 feet above the sea, frosts are by no means rare in June and July.

S. Paulo, the capital of the province of the same name, stands on a table land of the Serra do Mar, and has a climate much like that of Ribeirão Preto. The annual mean is 63°, and frosts are frequent in June and July, though the mercury does not quite descend to 32°. From October to December the winds blow from the S. E., from January to March from the N. N. W., and during the other months from the N. E. or S. E.

On this table land, and on those of the neighboring provinces, the climate marks a transition between that of the sub-tropical zone and that of the temperate region.

The southern portion of S. Paulo and the provinces of Paraná, Santa Catharina and Rio Grande form the third great division of Brazil, with one of the finest climates in the world. The temperature is mild and the mean is always below 68°. The moderate cold of July and August is equally favorable to the health of Europeans and to the development of European industries; and for this reason the current of immigration has been almost exclusively directed to these provinces.

The distribution of the rains is different from that which prevails in other parts of the Empire, and the distinction between the wet and the dry seasons is much less marked.

At Joinville (26° 17′ S.) the rainfall is 88 inches, nearly all in spring and summer, but on many of the highlands the rain comes in winter.

Snow is not rare, and at Lages (27° 43′ S. and 3,200 feet above the sea) there fell between the 26th and the 30th of July, 1858, such a quantity of snow that 30,000 head of cattle perished. Light falls are frequent even at a low elevation above the sea, but at Vaccaria (28° 33′ S.) not less than two feet six inches fell in August, 1879.

In the part of the province of Rio Grande south of 27° 5′, the rains come principally in the winter.

At Curytiba, the capital of Paraná, the mean temperature is 68°, at Joinville the same, and at Nova Petropolis it is 66°. One of the most important cities is Pelotao, situated in 31° 46′ S. Here there is a mean

annual temperature of 63°, the lowest point being 31° in June, and the hightest 100° in January. Thunder is heard on 33 days and rain falls on 83 days in the year.

Mr. Morize concludes his survey with the observation that the hot zone of Brazil is not kindly to the European constitution, but that this readily adapts itself to the climate of the second zone and finds that of the third favorable to a perfect health and vigor.

It will not have escaped the reader's attention that the observations so far recorded are limited to the provinces on the coast of the great Empire, and that nothing is yet known of the conditions in the interior.

METEOROLOGICAL OBSERVATIONS AT MEXICO. — The *Observatorio Meteorológico-Magnético Central*, of Mexico, has issued a table of calculated results of observations, made during the years 1877–1888. The metric system is employed :

Barometer :	annual mean	586.42
"	greatest height	594.19
"	lowest	579.80
Temperature :	mean, in the shade	15.5
"	highest in 12 years (Apr.)	31.6
"	lowest " "	1.7
Humidity :	annual mean	60
Rainfall :	total in 12 years	7424.9
"	greatest in the year (Aug.)	63.5
Cloudiness :	mean annual	5.0
"	prevailing direction	S.W.
Wind :	mean annual velocity	0.8
"	prevailing direction	N.W.

The Observatory is situated in N. Lat. 19° 26′, W. Long. (Greenwich) 6h. 36m. 27s. Height above the level of the sea, 2,282m. 5 (7,488.65 ft.). Height of the O of the barometric scale, above the side-walk of the National Palace, 17m. 04. Hypsometer, mean boiling

point, 92° 88 (Fahr. 199.05). Magnetic Data: mean declination 8° 16′ from N. to E.; mean inclination 45° 03′ 03″ .5.

THE COLUMBUS COLLECTION IN ITALY.—According to the plan decided upon by the Royal Commission the Collection will be divided into Six Volumes or Parts:

PART I.—*Writings of Columbus.*—Autographs and other writings, with critical illustrations.

PART II.—*Columbus and His Family.*—Origin of the Family, Birthplace of Columbus, Complete Collection of documents on the family and the person of Columbus, Medals and Portraits (supposed), Remains of Columbus: in Cuba or Santo Domingo?

PART III.—*Discovery of America.*—Written Correspondence, with mention of other important voyages of the time, Contemporary Narrators of the discovery, Passages of Geographical Works unpublished, or existing only in very rare editions, in which mention is made of Columbus's discovery, or of those that followed and extended his, down to the year 1530.

PART IV.—*The Navigation and Cartography of the Discovery.*—Ships in the Time of Columbus, Scientific Resources, Nautical Charts and other instruments of navigation in use, Notices of Charts made by Columbus and by his brothers, Maps of the discovery down to 1530.

PART V.—*Monographs.*—Italian predecessors or successors of Columbus, to the year 1530.

PART VI.—*Bibliography.*—Columbian Bibliography, Italian Bibliography relating to the discovery of America.

Most of these parts have already been assigned to persons especially qualified for the work. Mr. H. Harrisse is charged with the first part, the second has been confided to the Ligurian Sub-Committee, the third to Commissioner Berchet, the fourth to Commissioner De Albertis, and the fifth has been distributed among a number of scholars and scientific men. The sixth part has not yet been assigned.

The search made for documents in the Vatican archives has yielded good results, and interesting dispatches have been found in the Este Chancery at Modena; but, according to the Italian Geographical Society's *Bollettino*, from which these facts are taken, the examinations made at Naples, Palermo, Cagliari and Florence had, up to August last, produced nothing of importance.

ROME AND OTHER ITALIAN CITIES.—A recent publication, issued by the Italian Ministry of Agriculture, Industry and Commerce, presents some interesting facts concerning the larger cities of the kingdom.

The population of Rome in the spring of 1870 was 226,022. It had risen, at the end of 1871, to 244,484; at the end of 1876, to 272,560; and it amounted, on the 31st of December, 1881, to 300,467. The latest enumeration, made on the 31st of December, 1888, showed a total of 401,044.

On the 31st of December, 1881, the whole area of the city was 14,674,500 square metres. On the 31st of March, 1888, the area was 15,711,500 square metres. The ground covered by buildings, including court-yards and gardens attached to houses, but leaving out the

space occupied by churches and monuments, increased from 3,403,150 square metres on the 1st of January, 1882, to 4,718,115, on the 31st of March, 1888.

The streets of the city covered 2,492,469 square metres, on the 1st of January, 1882, and 3,487,861, on the 31st of March, 1888.

The churches and monuments occupied 578,170 square metres in 1882 and 598,220 in 1888.

The public fountains furnishing water number 356, classed as follows: 11 monumental, 16 smaller, 162 ancient sources, and 167 new ones, opened since 1870.

Nine other places are compared with Rome. Naples, still the largest city of the Peninsula, has done no more than hold her own. In 1881 she had 494,314 inhabitants and in 1888 512,000. The others are:

Milan,	(1881)	321.839	(1888)		406,592.
Turin,	"	252,832	"		305,144.
Palermo,	"	244,991	"		261,571.
Genoa,	"	179,515	"		206,088.
Florence,	"	169,001	"		no ret'rn
Venice	"	134,810	"		149,635.
Bologna	"	123,274	"		136,608.
Catania	"	100,417	"		no ret'rn

The population of the kingdom, on the 31st of December, 1881, was 28,459,628. On the 31st of December, 1887, the number was found to be 30,260,065; an increase of 1,800,437. For the same period, 1881–1887, the total emigration was 1,154,199. It is clear, therefore, that the large cities do not grow at the expense of the country, but by a slow and healthy process.

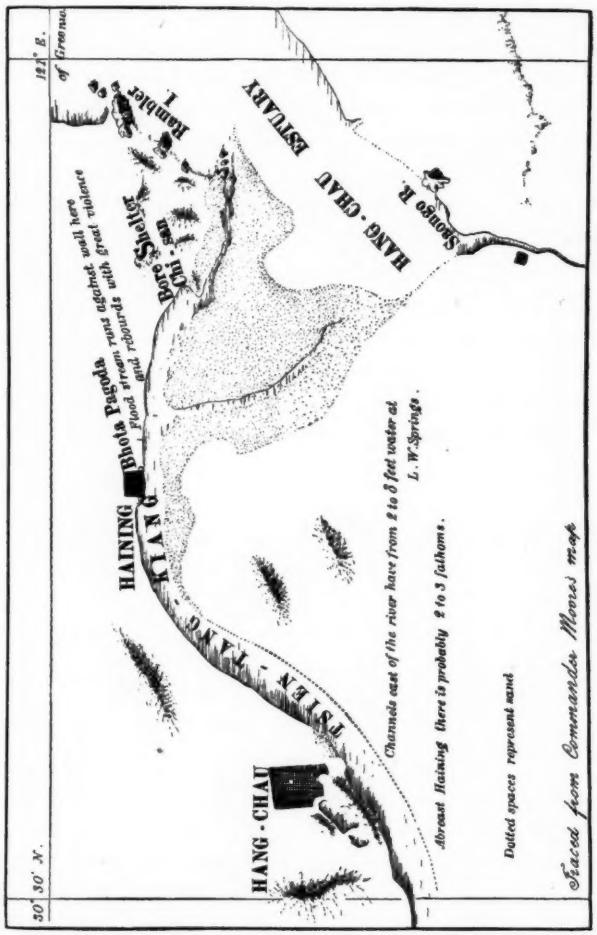
There is nothing abnormal in the proportions of the Italian emigration. It bears comparison with that from the British Islands. The population of the United

Kingdom was, on the 31st of December, 1871, 31,857,-338. The census returns for 1881 showed a total of 35,241,482; a gain in the ten years of 3,384,144. The emigration for the years 1881–1887 amounted to 2,498,-540 persons, one-fourth of them classed as foreigners, so that the actual British emigration for the period was 1,873,905. The increase of the population, taking the average of the ten years ending with 1881, would be, for seven years, 2,368,898; and the actual gain for the seven years, less the emigration, would be 494,993.

THE BORE OF THE TSIEN-TANG KIANG.—Commander Osborne Moore, R. N., contributes to the Journal of the China Branch of the Royal Asiatic Society, a paper on the Bore of the Tsien-Tang Kiang (Hang-Chau Bay).

The Hang-Chau Gulf, he says, had always excited his curiosity because, though it led into the heart of a great silk country, it was shunned by seamen. In his paper he has endeavored to show why the Tsien-tang is blocked.

The furthermost limit in the Gulf for safe navigation is an island (Rambler Island) at the S. W. extremity of Chapu Bay. Here, on the 19th of September, 1888, Commander Moore's vessel, the *Rambler*, was moored. A tide-pole was erected and observations were made of the rise and fall of the water for three days and nights, beginning with full moon. At the same time observations were noted at West Volcano Island, 45 miles E. of Rambler Island; and a fortnight before records had been made simultaneously at West Volcano Island and Chang-tau. It was therefore possible to trace the pro-



gress of the tidal wave from the ocean to the estuary of the Tsien-tang. The miles are geographical.

September 20th a start was made, with the first of the

flood-tide, in two steam-cutters and a sailing-cutter, to meet the Bore. All went well for three hours, when the ground was struck, with the tide running 10 to 11 miles an hour, and the water rose 9 feet in half-an-hour. Fortunately, the vessels had missed their way, the chart being incorrect, and instead of meeting the main Bore had dropped into the south branch of it. That afternoon the river was found, and the boats were run ashore opposite Haining, with anchors laid out and buried and every precaution taken for the next flood. The keels of the boats were 7 to 8 feet above low-water, and they must have been half-a-mile from the nearest part of the Bore. The steam-cutter had 33 fathoms of stout chain with a 60-lb. anchor, backed up by 4 iron weights of 56 lbs. each, and a 2 cwt. bag of coal on the bight of the chain, 1½ fathoms from the anchor.

The sailing-cutter had a 60 lb. anchor buried in the sand, with 30 fathoms grapnel taut, and 2 2-cwt. bags of coal on the grapnel, near the anchor.

It was a still night, with a little rain. The murmur of the Bore in the distance was heard at 11.29; the cascade could be seen at 11.55, and it passed with a loud roar at 12.20, well over on the north bank of the river. All that could be seen was a steep slope of white water, over-falling and pouring over itself as it advanced, the river filling up to the level of the flood as the Bore went by. At 12.25 the boats floated at once. The steam-cutter brought up with a jerk and drove to the westward, the sailing-cutter following, and both dragged for a distance of 3 miles in 25 minutes. The strength of the current must have been at least 10 miles an hour, and the height of the Bore was 10 to 11 feet. When

the anchors of the cutters were weighed it was found that the flukes which had been in the sand, and a great part of the chains, were burnished bright like polished silver. The coal in the bags, with the exception of ½-cwt. in one bag, was all washed out, and the bags were filled with sand tightly packed.

The sudden rise of water, which occurred with every flood at Rambler Island, commenced this night at 9.30, so that there was an interval of nearly 3 hours between the appearance of the Bore there and at Haining.

September 21st, at 9.45 A. M., an overfall was seen 4 or 5 miles in the offing to the N.E. It reached the *Rambler* at 10.15, and disappeared to the westward past Rambler Island. Here the water suddenly began rising at 10 A. M., and rose 13 feet 11 inches in 1 hour.

From the south bank of the entrance of the Tsien-tang Kiang the Bore was seen approaching along the sea-wall between Haining and Chi-san at 12.24.

The weather was calm and there was a good deal of mirage. The appearance was that of a long, crested wave, breaking in places, in others only about to break; the top of the flood curving towards the *Rambler* and drawing back, hurried on by the great speed of the Bore. At 12.47 the Bore passed Haining Pagoda, the front part a white cascade of foaming water, and the south side a long line of breakers and wall of water, tapering from the front to the smooth following water half-a-mile behind, the breakers discharging outwards towards the south bank of the river.

For a long distance behind the crest there was on the top of the Bore broken water, in which no ordinary boat would have lived, and conspicuous above the disturbed

water a second roller or miniature Bore occasionally rose up, and after moving onwards with the rest for a time, would leap up as if struck by some unseen force, and disappear in a cloud of spray. The height of the Bore was 9 feet, but the broken water behind it could not have been less than 13 or 14 feet above the level of the river in front. The Chinese said this was not a high Bore. Nine junks came up behind the disturbed water, with sails set (there was no wind), and entered the river at great speed.

A feature worth noticing was the deliberation of the curved side in breaking, It looked, at times, as if the great speed checked the curve just as it was about to make its arch over on the sand.

Commander Moore finds himself obliged to disagree with Dr. Macgowan, who has recorded his observation of a Bore 30 feet high at Hang-chau, and has affirmed that the cascade was higher off the city than at the mouth of the river. Commander Moore argues that a Bore cannot be higher than high-water spring tide, which has a range at the mouth of the river of 19 to 20 feet, while the cascade there is generally three times as high as it is off the city of Hang-chau.

During the few days, stay of the *Rambler* in Hang-chau Gulf, her cables were much damaged by the violent ebb-stream, which ran with its greatest velocity between the second and third hour after high-water; and when they were weighing anchor on the 24th of September, a north-east wind sprang up with the flood-tide, and a severe overfall surrounded the ship for two hours with waves as high as the gunwale. She got away at last with the loss of all the pauls and bars of the capstan.

The junks that frequent Haining ground one and a half to two hours after high-water on a platform of stones enclosed by piles alongside the sea-wall. This platform is 1,100 yards long and 20 feet wide, and 7 to 8 feet above low-water ordinary spring tide. It is protected at the eastern end against the Bore by a semi-elliptical buttress, 253 feet long and 66 feet wide. The sea-wall is said to be more than 500 years old. It extends without interruption to Chi-san eastward and 19 or 20 miles up the river. It is about 30 feet wide and is faced with blocks of stone 5 feet long, 16 inches broad and 14 inches thick, laid endways out and joined together by rivets of iron. Its top is 3 to 4 feet above high-water. About 1,000 men are constantly employed in its repair, and the 12 miles of it that came under Commander Moore's inspection were in excellent condition. Behind the sea-wall is an embankment from 50 to 60 feet wide, and this is continued with more or less regularity from the Tsien-tang Kiang to Woosung, round Yangtze Cape, a distance of 120 miles.

Commander Moore returned to Haining on the 4th of October, and observed the Bore for four days. According to the natives, no one of the cascades seen in these two visits was as high as the highest winter Bores.

The Bore occurs about the time of full moon and new moon and, speaking generally, passes Haining as the moon crosses the meridian.

The Chinese declared that the Bore passed Haining with every flood-tide throughout the year, but this statement lacks confirmation.

The causes of the Bore are three :

1. The funnel shape of the Hang-chau Gulf, which is

open to the eastward, directly in front of the tidal wave from the Pacific. The Gulf is 50 to 60 miles wide at the mouth and about 10 miles wide at the narrower part where navigation ends, and the general depth is much greater across the mouth than it is in the western part.

2. The large area of sand-flats at the head of the Gulf.

3. The out-going stream from the Tsien-tang Kiang.

If Dr. Macgowan has overestimated the height of the Bore in the Chinese river, he is sobriety itself compared with some of those who have described the *pororoca** of the Amazon. Commander Moore quotes from Alison's "History of Europe," chap. 67, a passage in which occurs the following lively picture of the phenomenon:

"In the shock of the enormous masses of water, a ridge of surf and foam is often raised to the height of a hundred and eighty feet; the islands in the neighborhood are shaken by the strife; the fishers, the boatmen and the alligators withdraw trembling from the shock."

Naturally enough, the historian's rhetoric reduced Commander Moore to the state of an alligator and a boatman. "I rose from the perusal of the description," he says, "with a feeling of humiliating inferiority, and

*The *Century Dictionary* (*art.* BORE) spells this word *prororoca*, but the true form is the one given by the Brazilian writers. To quote but two: the *Corografia Brazilica*, vol. 2, p. 260, defines the bore as the result of the encounter between the river current and the tide, the shock causing "very rough waves, called *pórórócas*," (ondas encapelladas, chamadas *pórórócas*); and the *Diccionario Geographico*, of Lopes de Moura, vol. 1, p. 44, says that the phenomenon is observed "with every tide at the times of new and full moon; the natives of Brazil call it *pororóca*;" (em todas as mares de lua nova e cheia; chamão-no os naturaes do Brazil *pororóca*).

the conviction that nothing would astonish me in future, . . . quite prepared . . . to learn that there is a Bore, about the globe somewhere, as high as the ball of St. Paul's Cathedral."

EARTHQUAKE OBSERVATIONS IN JAPAN IN 1886.—In the *Transactions* of the Seismological Society of Japan, Vol. XIII., Part I., Mr. John Milne presents a translation, with prefatory note and general observations, of a Report published by the Meteorological Central Observatory at Tōkyō. This report refers to observations, made at some 650 stations in various parts of the Empire in 1886, and gives in a second portion the analyses of earthquakes recorded by instruments during eleven years at the Observatory.

The total number of earthquakes in 1886 was 472, while in 1885 there were 482. The districts neighboring the Japan Sea felt few or no shocks; the ranges of mountains forming the back-bone of the mainland and passing between Tosan, Hokuriku, Sanin and Sanyō, seeming to divide the country into two portions, one of which is constantly shaken, while the other is almost undisturbed. The earthquake seasons are not well defined. The monthly average for 1886 was 39.3. March, May, August, September and December were above the average and the other months below it. Taking the four seasons, the greatest number of shocks occurred in spring and the smallest in autumn. In 1885 the contrary was the case. Taking the time of the day for the two years there were more earthquakes between noon and midnight than between midnight and noon.

The areas of the districts shaken are given in square

ri (1 square *ri*=5.95 square miles). The total area shaken in 1886 was 92,050 square *ri*, or 3.8 times the total area of the country. In 1885 the area shaken was 132,300 square *ri*. In 1886 349 shocks were limited to less than 100 square *ri*, 104 extended over more than 100 and less than 1,000, 19 were felt through an area of from 1,000 to 4,000, and one shook an extent of more than 5,000 square *ri*. The intensity was variable. With regard to origin, 228 shocks may be traced to the coast or under the sea, and 244 originated beneath the land. These latter merely caused limited disturbances.

The observations do not strikingly illustrate the relation of earthquakes to volcanoes. Many shocks were felt in the districts of Musashi, Kazusa, Shimōsa, Kōdzuke, Shimotsuke and Hitachi, all nearly inclosed by ranges of volcanoes, but there were many earthquakes also in Kii, which is quite apart from any volcano.

There are many provinces in which there are volcanic peaks, but where no earthquakes have been felt. One of the severe earthquakes of the year occurred on the 13th of April at 5.50 A. M. Its direction was not uniform, but was from south-west to north-east in several of the places most strongly shaken, and in two places the vibrations continued for three minutes. Its origin seemed to be in the Pacific. At about dawn of the same day there was an eruption of Mount Tarumai, in Iburi, Hokkaido (Yesso), and a feeble shock was felt at Nemuro in the same island.

In the eleven years, 1876–1886, during which systematic records were kept at Tōkyō, there were 958 earthquakes. The largest number for any one year was 77, in 1880; the smallest, 32, in 1883. The average for the

seasons was 15. There were more than 15 in the spring and in the winter, and the numbers for summer and for autumn fell below the average. The highest average was for the winter months and the lowest for the summer.

Generally speaking, the disturbances are frequent at night, especially from 8 to 9 P. M., during the six months from July to December. No very severe shock has occurred at Tōkyō since the observations were begun.

Nothing definite has yet been found as to the relation between earthquakes and atmospheric pressure. With regard to temperature, the shocks were numerous when it was falling, few when it was settled, and tolerably frequent when it was rising. Many earthquakes affect but a very small area, and it is Professor Milne's belief that if instruments were more generally distributed throughout Japan and the number of observers increased, the number of shocks recorded might easily be increased to 1,000.

LIEUT. TAPPENBECK'S LAST REPORT.—A few pages of the *Mittheilungen aus den Deutschen Schutzgebieten*, Band II, Heft III, are devoted to the memory of Lieutenant Tappenbeck, one of the latest victims of the African fever; and in the same number appears his last report, written at Kamerun, July 12th, while the hand of death was on him. The report, he says, is brief, but will be followed by one containing more ample details. Captain Kund set out from the Jeundo Station for the coast, on the 12th of March, with sixty persons. Next day natives reported to Lieutenant Tappenbeck that Kund's company had been fired upon by the Jande and

Jatenge ; but the Jeundo and other small tribes remained friendly and peaceful, and offered no interruption to the work on the Station buildings. Supplies of food came in daily, yams, bananas, manioc, sweet potatoes, maize, ground-nuts, palm oil, pumpkins, pine-apples and lemons, besides eggs and fowls, goats and sheep.

The Ngumba, the only tribe that could have blocked the road from the Jeundo country to the coast did not dare to show any hostility to the Germans. This tribe is dwindling physically and morally, and must in no long time disappear before the Bulei. "Other tribes," says Lieutenant Tappenbeck, "neighbors of the Jeundo, are always on bad terms with them, for the most part through envy, because the whites dwell in the Jeundo territory ; though it may very well be, that this tribe turns our presence to account in its quarrels by threatening, without our knowledge, to call upon us for help. The Ngumba constantly asked us to aid them against the Bulei. I have always refused these requests for the aid of our weapons, and have sought to make the people understand that we were friendly to all, and that though we lived among the Jeundo, every one, whether Toni or Bane, or Jatenge, or Jetudi, or Tinga, was free to come to us."

This was Tappenbeck's rule in African travel.

On the 9th of May orders came to march to the Sannaga River. The start was made on the 15th with 120 men, and on the 24th the Sannaga was reached at about the point occupied the year before. Four days were lost in order to recover a stolen gun. On the 27th the party arrived at the capital of the Chief Ngirang. This town, which lies in 4° 42′ N. Lat., and about 12°

25′ E. Lon., contains 500 or 600 huts and 1,800 inhabitants, and is one of the greatest ivory and slave markets of the southern Adamaua country, to which it belongs politically, though not geographically. The German officer and his people were received in the most friendly way, in spite of the fact that Guatare, the village they had been forced to burn the previous year, belonged to Ngirang's land and was ruled by one of his brothers.

During the six days of their stay the chief supplied all their wants without compensation. Lieutenant Tappenbeck accepted the first gifts forced upon him—four elephant tusks and a native robe—but refused to take any more, telling the chief that it was impossible to take presents for which no equivalent could be offered. To this the chief replied that he did not make presents in order to have something given to him in return; "an answer," says Lieutenant Tappenbeck, "which I then heard for the first time in Africa." These gifts that were sent back were a quantity of very valuable ivory and 120 women, for the chief had a royal mind.

It was not easy to send messages from Ngirang's town to the coast, for there is no friendly feeling between the Kamerun coast tribes and those of the Adamaua region. These latter are great slave-hunters, and while the German party was staying with Ngirang, some of his warriors brought in 180 men, women and children as prisoners, and 100 slaves, mostly women, were ready to be sent to Iola. The district on the northern bank of the Sannaga, passed over by the expedition of the preceding year, was completely devastated. Whole villages were demolished and those of the natives, who escaped

from the slave-hunters, took refuge on the islands of the Sannaga. All this was the work of the chief Mango, whose town lies two days' journey to the eastward of Ngirang's. It was Lieutenant Tappenbeck's purpose to visit this slave-hunting chief at a later day. The northern side of the Sannaga, he concluded from what he saw, would soon be unable to supply victims for the trade, and the hunters would cross the river to the thickly-peopled districts on the south. Ngirang and Mango sent their slaves and ivory to Sokoto, Adamaua and Bagermi. The dealers said that the greater part of the merchandise went still farther, from Sokoto to Salaga, which supplies copper, and from Bagermi to Bornu, and probably to East Africa.

"These names," says Lieutenant Tappenbeck, "are familiarly known to every dealer." "It is my firm conviction," he adds, "that the Jeundo Station will become a great protection to the tribes in the neighborhood. No slave-hunters will venture to invade a land where a white man has his house, and it would be ill for them if they did, for I would undertake to defeat chiefs like Ngirang and Mango with no more than 100 well-armed men. Their success has been won by the sound of their names; and when Ngirang sends out 50 warriors, they are enough to put 500 enemies to flight, such is the spell of a terrible name over the minds of the blacks, not only here, but throughout Africa. If our Station can hold out with the same success against the hostile tribes for a year, a single European with thirty men will be enough to enforce respect. It is of great importance to keep the roads open towards the Adamaua country, so that we may become thoroughly acquainted with the

relations of that district. This will take years, but we shall then be in a position to decide whether it is possible to suppress the slave-trade, and how this is to be done."

He returned to the Station on the 10th of June, and for some days the people came in crowds to see the men who had been to Ngirang's town and had actually come back. A number of the Jeundo natives wanted to go with the Germans to the coast. Lieutenant Tappenbeck chose five men, among them three sons of a chief, named Zonu, on whose ground the station stood. On the 17th of June he set out with 138 persons, and five hours after shots were fired at the caravan by natives of the Jatenge tribe. The next village was immediately occupied and put in a state of defence. These Jatenge belonged to the tribe that had attacked Kund's party. Three months before they had fallen upon the Jeundo, and as these had asked help of the Germans and had been refused, the Jatenge perhaps imagined that the white men feared them.

Lieutenant Tappenbeck soon undeceived them. On the 20th of June a party of 20 men fell upon the assembled force of the hostile tribe, with which the Jande had united themselves, while they were all engaged in war-dances, and struck such terror into them that they fled without firing a shot. Two of their most prominent chiefs and nine others were killed, and the number of wounded must have been considerable; and the survivors did not reappear.

This result greatly pleased the German commander, who had seen for some time that a collision with the natives was rather to be desired than avoided in order

to re-establish the belief in the invincibility of the white men. The Jetudi, who were before planning an ambush for the expedition, made haste to send messengers with protestations of their friendly feelings. Five days after the fight the chief Zonu said: "Now there is nothing to hinder your march to the coast. No one will meddle with you, and if you send a messenger with letters, he will go through in safety." It was easy to believe he meant what he said, for his sons were with the party and free to withdraw if they wished.

The Germans had five men wounded and not one killed, and this result seemed to the natives a miracle.

On the 4th of July the Kribi Station was reached after twelve extraordinary forced marches. Eighteen Mpangwe, whose time had expired, were left there.

In closing his report the young officer says he had been suffering for some time with fever, but that all the people, left at the Jeundo Station, were in good health.

STANLEY'S TRIUMPH.—The letters and the telegrams have told the result of Stanley's march through the unknown centre of Africa.

The story is not yet put into form. There are breaks and lapses in the narrative, and dates—always a weak point in Stanley's accounts—are often wanting; but the explorer has returned from the wilderness with an immense accession of renown, with new discoveries, not yet reconcilable with previous reports, and with Emin Pasha himself,* for whose rescue the expedition was undertaken. The first dispatch was received by the Emin

* Not alone, but with his daughter (*filiola auctum*, in Ciceronian phrase,) and, apparently, no mother for the child.

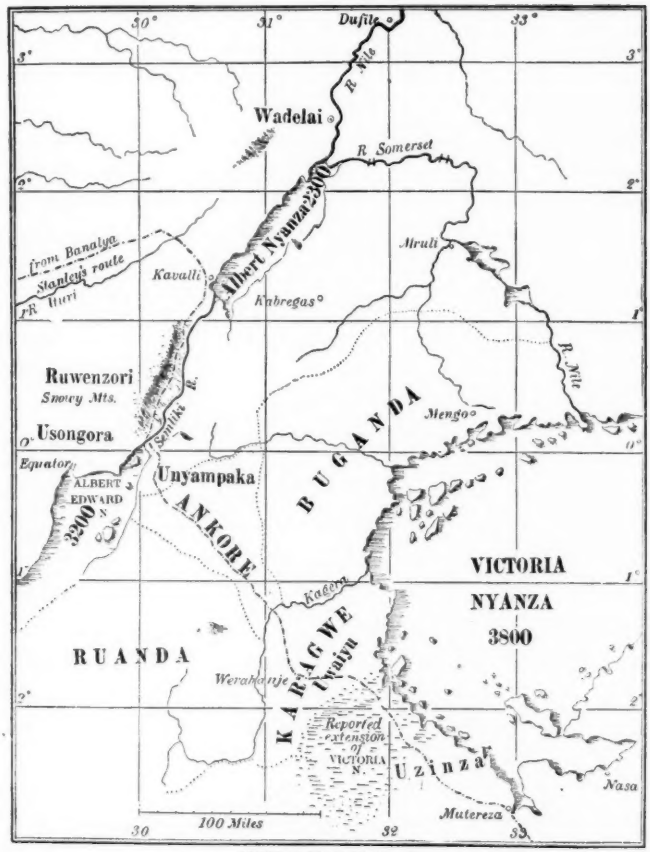
Relief Committee in London on the 4th of November. It announced the capture of Emin and Jephson on the 18th of August, 1888, the revolt of Emin's troops and their union with the Mahdists, and a subsequent reverse of the latter. It added that a letter waiting for him near the Albert Nyanza urged the necessity of Stanley's arrival before the end of December, that he arrived on the 18th of January, that he waited from the 14th of February to the 8th of May for the fugitives, and that he then left the Albert Nyanza, homeward bound.

Nothing was said of what occurred between the 18th of January and the 14th of February, and the rest of the dispatch read:

"By the route taken I traversed the Semliki Valley, the Awamba, the Usongora, the Toro, the Utraiyana, the Unyampaka, the Ankori, the Karagwe, the Uwaiya, the Uzinza, the South Victoria and the Nyanza. No hostile natives were met. Since we left Kabrega we travelled along the base of the snowy range Ruwenzori. Three sides of the Southern Nyanza or Nyanza of Usongora, which is called now Albert Edward Nyanza, are about 900 feet higher than Albert Nyanza, having an exit at Semliki which receives over fifty streams from the Ruwenzori and finally enters the Albert Nyanza, making the Albert Edward the source of the southwest branch of the White Nile, the Victoria Nyanza being the source of the southeast branch."

The map shows the supposed route to the southern end of the Victoria Nyanza, beyond which, about 350 miles to the southeast, lies Mpwapwa.

The Ruwenzori Range is a real addition to the maps, and it is something to have settled the relation of the



STANLEY'S ROUTE TO MPWAPWA.

Muta Nzige (Albert Edward Nyanza) to the Nile system, though it must be regretted that Stanley felt himself free to baptize this body of water. He has made wonderful discoveries, but his taste in names is deplorable.

Variety is the spice of geography, as well as of life, and the compliment to the Prince of Wales would have been the same if the lake had been called H. R. H.

The extension of the Victoria Nyanza to the southwest (indicated on the map) is, of course, to be accepted as news, though it contradicts Stanley's previous reports in his "Through the Dark Continent," Vol. I, pp. 156–186, 211–241, Vol. II, p. 18: "The saucy English-built boat which had made the acquaintance of all the bays and inlets of the Victoria Nyanza," etc.; and their restatement, in substance, seven years later, in "The Congo," Vol. I, p. 20: "The Dark Continent had been traversed from East to West, its great lakes, the Victoria Nyanza and the Tanganika, had been circumnavigated," etc.

The smallest area assigned to the extension just discovered is 2,000 square miles, the largest 27,000; ānd it ought to have been visible at the time of the careful circumnavigation.

Burdened as he was with anxieties and pre-occupied with his one great object, the rescue of Emin, Stanley could give but little attention to the details of exploration, and much has necessarily been left to a future day and, it must be hoped, to him.

Writing, as he evidently did, under a pardonable sense of impatience at the obstacles interposed by Emin, when everything was ready for his safe retreat, Stanley seems yet to have allowed himself too great a licence in his expressions. The reproach of weakness and lack of resolution, nowhere directly made, underlies all his remarks concerning Emin.

It is implied that the revolt of Emin's troops was prima-

rily due to the feebleness of their commander; an implication the more ungenerous that Stanley has the ear of the public.

When it is remembered that Emin Pasha maintained his authority and controlled his vast Equatorial Province from the date of his appointment by Gordon in 1878 down to the present year, with no other European help or advice than that of the Russian, Dr. Junker, for a time, and that of Captain Casati through nearly the whole period, it is not too much to say that any suggestion of incompetence on his part simply discredits the man who makes it.

Stanley has perhaps an inadequate appreciation of other men's work, but his letters show that his success has only strengthened his trust in the protection of an overruling Providence. This is the mark of an earnest nature. There is no reason to believe that the ruin of all his hopes has availed to shake the faith of Emin, and it is more than probable that the Mahdists recognize in their own conquest of the Equatorial Province the direct interposition of God.

The United States: Facts and Figures illustrating the Physical Geography of the Country, and Its Material Resources. Written for, and published in part in, the Encyclopædia Britannica (Ninth Edition). By J. D. Whitney. *Boston, 1889.*

Professor Whitney says, in his preface: "As published in that work (the Encyclopædia Britannica), portions of the matter furnished were found to have been omitted altogether, and other portions materially altered by attempts at condensation, so that the meaning was often

obscured, and sometimes even rendered entirely unintelligible. . . . Under these circumstances I have thought it best to reprint the article as originally written, with very few alterations, and these mostly in the form of notes."

Professor Whitney has rather understated his case. His article, as printed in the *Encyclopædia Britannica*, contains less than half the matter of the present work, exclusive of the Appendix, and the student rises from the comparison of the two with the uncomfortable feeling that other articles in the great book of reference may have suffered to a like extent at the publishers' hands.

It was a difficult task to present within a moderate compass an account of a territory so vast as that of the United States, and the work has been well done, with no less regard to the interest of the subject than to accuracy of statement.

The divisions are: Physical Geography and Geology, Political and Natural Subdivisions, Climate, Forests and Vegetation, Scenographical, Population, and Immigration, The Public Lands, Mineral Resources, Agriculture, Manufactures, Foreign Commerce, and an Appendix, devoted to a Sketch of Geographical Discovery on the Pacific Coast, a Sketch of the Progress of American Cartography during the Past Half-Century, and Remarks on the Methods by which the Elevations of Mountains in the United States have been determined.

Professor Whitney's Theory of the Prairies, which is the result of years of investigation on the spot, will be called in question. He is convinced that the real cause

of the absence of trees on the prairies is "the physical character of the soil and especially its exceeding fineness, which is prejudicial to the growth of anything but a superficial vegetation, the smallness of the particles of soil being an insuperable barrier to the necessary access of air to the roots of a deeply-rooted vegetation." It is found that wherever in the midst of this fine soil coarse or gravelly patches exist, there dense forests occur. This theory that fineness of soil is fatal to tree-growth finds its most remarkable support in the fact that in Southeastern Russia the limits of the *black earth* and the treeless region are almost exactly identical.

It will surprise many to learn that the value of the wood consumed as fuel in the United States was, in 1880, three times as great as that of the coal mined. "In fact," says Professor Whitney, "the timber of the country is the greatest of all its material possessions;" and he seems to be entirely free from the feeling of anxiety with which many regard the disappearance of our forests. "The timber," he says, "is restored, after destruction by man, by the kindly hand of Nature. This is the case, at least, over the whole of the once densely-timbered portion of the country, where the various growths succeeding each other after the primal forest has been removed offer a satisfactory substitute for that which has been made use of, either naturally or as an easily attainable result of cultivation."

It may be objected to this cheerful view of the situation, that very many tracts, once fully timbered, are now bare and desolate; but even the kindly hand of Nature must sometimes feel the need of repose.

The Bermuda Islands: A Contribution to the Physical History and Zoology of the Somers Archipelago. With an Examination of the Structure of Coral Reefs. By Angelo Heilprin. With Additions by Prof. J. Playfair McMurrich, Mr. H. A. Pilsbry, Dr. George Marx, Dr. P. R. Uhler, and Mr. C. H. Bollman.
8vo. *Philadelphia, 1889.*

Extremes point to each other. Professor Heilprin's scrupulous enumeration of those who have aided him in his work recalls, by contrast, the practice of a writer farther to the West. If the historian may justly be reproached with putting a small part for the whole, Professor Heilprin cuts up the whole into too many parts.

About half the present volume is devoted to the zoology of the Bermudas, and the conclusions arrived at are:

That the fauna is a wind-drift and current-drift fauna, the aquatic animals belonging to the West Indies, the birds and insects to North America, though some portion may have come from Eurafrica, while the terrestrial Mollusca and the arachnids and echinoderms may have been partly developed from a fauna existing on the spot before the present physical conditions were established. That the *currental* water which separates the United States from the Bermudas is a practically insuperable barrier to the direct passage of marine animals from one region to the other, and that an arm of the sea may stop marine animals as effectually as it would land animals.

These views accord with those of Mr. Wallace.

The physical history and geology of the Bermuda

group, as read by Professor Heilprin, show that elevation and subsidence both marked the region in its development and these conditions, he says, "are more in consonance with the Darwinian hypothesis than with any other."

In the chapter on the Coral-Reef Problem, Professor Heilprin takes a position of antagonism to Mr. Guppy and Prof. Alex. Agassiz, and maintains, after examining their objections to the Darwinian view, that the theory of subsidence accords best with the facts and may be said to be in substantial harmony with them. Mr. Agassiz asserts that the Florida reefs have not been assisted in their upward growth by elevation, but Mr. Heilprin declares that there is, in the regular horizontal limestone beds of the southern part of the peninsula, the most conclusive evidence of elevation, even as late as the Pliocene and Post-Pliocene periods, and that there is every reason to believe that this upward movement did not stop short of the Coral-forming tract. He thinks it probable that the Straits of Florida and some of the deep channels separating the West Indian islands were formed through subsidence. The case is still before the Court, and not many now living may hope to see it decided.

In the notes on the zoology of the Bermudas, Professor Heilprin says: "As might have been anticipated the greatest profusion of animal life was found on the edge of the growing reef itself, the shoals surrounding the cluster of rocks on the northern barrier known as the North Rock. The wealth of forms occurring here almost transcends belief. . . . All the dredgings were confined to depths within 16 fathoms, which also

represents the greatest sounding made by us in the lagoons."

The list of the marine and land forms fills about 100 pages, and many types are represented in the plates that illustrate the work; but there is no index.

The Ethnologic Affinities of the Ancient Etruscans. By Daniel G. Brinton, M. D.

Philadelphia, 1889.

This contribution to the literature of the Etruscan puzzle was read before the American Philosophical Society in October last.

Dr. Brinton spent some time in the summer of 1889 among the Kabyles, and when, not long after, he came to study the portrait busts on the Etruscan tombs, he was struck with the resemblance between the two types. This incident led him to make a more extended examination and, as the result of this, he advocates the Libyan origin of the Etruscans. His arguments are:

1. Testimony and tradition assert that the Etruscans came into Italy across the sea, from the south.

2. Physically, they were tall and of blond type, with dolichocephalic heads, like the ancient Libyans and the modern Berbers and Guanches.

3. In the position assigned to woman and in the system of federal government the Etruscans and the Libyans were in accord.

4. The phonetics, grammatical plan, vocabulary, numerals and proper names of the Etruscans present analogies with the Libyan dialects, ancient and modern.

Hints to Travellers, Scientific and General. Edited for the Council of the Royal Geographical Society, by Douglas W. Freshfield, Hon. Sec. R. G. S., and Captain W. J. L. Wharton, R. N., F. R. S., Hydrographer to the Admiralty. Sixth Edition, Revised and Enlarged.

8vo. *London, 1889.*

(*from the Royal Geographical Society.*)

It is said in the preface that this sixth edition of the well-known "Hints" is substantially a reprint of the fifth, with such corrections and additions as time and experience have suggested. Critics more competent and more pitiless could not well be found, but the little book has no reason to fear even them. It has won and will keep its place as the necessary companion of every one who would see the world to the increase of knowledge for himself, or for others; and the reading of it is profitable even for those few persons, every day diminishing in number, who are content to do all their travelling at home.

Le Sénégal—La France dans l'Afrique Occidentale. Par le général Faidherbe, de l'Institut. Ouvrage contenant 18 gravures d'après les dessins de Riou, 3 gravures de Thiriat d'après des photographies, et 5 cartes ou plans.

8vo. *Paris, 1889.*

The introduction to this monumental book closes with the words: "The state of my health would not have allowed me to finish the work which I now lay before the public but for the help given by Captains Bizard and Brosselard and, especially by Captain Ancelle; and

for this help I now offer them my sincere acknowledgments."

The book had hardly made its appearance when death put an end to the author's long and most honorable career. Senegal, says General Faidherbe, is the oldest colony of France. It is, none the less, by the common consent of all who are acquainted with its history, the creation of General Faidherbe himself, since he first of all established it upon a firm foundation and gave it space and breadth and symmetry. Made governor of the colony in 1854, he applied himself to the study of the country and the tribes, their manners and their languages, and their relations with each other and with the French. He won the native chiefs, whenever it was possible to win them, by friendly overtures; but when, as with El-hadj Omar, a conflict was found to be inevitable, the governor accepted it without hesitation and forced it to a conclusion with equal ability and vigor. He planted military posts at every commanding point from the sea-coast to the head-waters of the Senegal, and the supremacy of the French in all that territory has never since been called in question. He provided for the future extension of the French influence to the eastward by planning an expedition beyond the watershed that separates the Senegal from the Niger; and the voyage of Lieutenant Caron on this latter river as far as Timbuktu is the realization of Faidherbe's large design.

There are, says General Faidherbe, three distinct zones in the western part of North Africa, the Tell, the Sahara, and the Soudan. The Tell is the region north of the Sahara, and a true European region, for it is not

the Mediterranean but the Sahara, which divides Europe from Africa. South of the Sahara, in Senegambia, is Africa, with its two seasons; the dry season, from November to July, when the heat is almost endurable, when it never rains, and the desert wind does not blow; and the rainy season, with its excessive heat and pernicious fevers and stifling calms, broken by torrents of rain and violent storms. Here the flowers are few and scentless; there is an infinite variety of birds, with most brilliant plumage, but generally songless; there are vast rivers, abounding with the hippopotamus and the sea-cow and the crocodile, and unbroken forests that shelter the elephant and the giraffe. This is the home of the black man, who has suffered so much at the hands of others more civilized than himself; a being naturally good, with an intelligence comparable to that of many of the whites, but deficient in character, that is to say, in force of will, of forethought and of perseverance, so that he will always be at the mercy of more highly-gifted races.

There are exceptions even to this rule, and General Faidherbe quotes, from a work printed at Amsterdam in 1789, a very dramatic story of a revolt planned by five hundred captives in Western Africa. The plan was reported to the whites by a child, 12 or 13 years old, and the commander of the garrison assembled the negroes in the fort and questioned the two leaders, who confessed their design and said that they and their companions had been moved to win their freedom, not out of hatred to the whites, but because they were all ashamed of not having died with arms in their hands instead of submitting to slavery. The chiefs were put

to death, and the others were sent to the West Indies. These Senegambians are often indomitable men, and one of them at St. Louis, not many years ago, having been recaptured after frequent escapes, refused to eat or drink for ten days because his hands had been bound, and he would not lick up his food, he said, like a dog. To save his life his hands were untied when his food was brought. Stories not unlike this are told of the Minas in Brazil and the Lucumis in Cuba; and General Faidherbe finds an explanation of the submissive temper shown by most of the negro slaves in America in the fact that the resolute and high-spirited mostly fight to the death when the slave-hunters attack the villages, and that few of them are captured.

The finest race among the blacks of Senegambia is the Wolof, which takes readily to civilization.

The right bank of the Senegal is held by the Trarzas, the Braknas, the Douaish and others, known collectively as Moors, and held in detestation for their cruelty.

The products of Senegal are cotton, indigo, rubber, palm-oil, skins, timber, cattle, rice, honey and wax, sorghum, ground-nuts, gums and coffee, which is, according to General Faidherbe, the very best in the world, and the parent of the Mocha berry.

The successive advances of the French into the interior of the country are described briefly and yet with such detail that no significant fact in the history of Senegal, since the abolition of slavery in 1848, is neglected.

General Faidherbe's conclusion is that Senegal presents an almost infinite field of activity to French commerce, which must content itself with "colonies of this type since, so far from producing the necessary emi-

grating element, we have need of a million immigrants at home."

He gives a negative answer to the question whether the French are a colonizing people. Two-thirds of the Europeans in Algeria, he says, are Spaniards and Italians; and he has no illusions with regard to Canada as a typical French colony.

His language deserves to be studied. "We were once able to colonize," he declares, "and we are so no longer, and the causes of this degeneracy are not far to seek. It is true that Canada has been peopled by a Franco-Norman race, but it has prospered and the colony availed itself of its boundless natural resources because it was violently separated from the mother-country a hundred and twenty-six years ago. Among the people of the same race as the Canadians, that is to say, among the inhabitants of the Departments of Seine-Inférieure, of Eure, of Calvados, of La Manche, and of Orne, the birth-rate is to day the lowest in all France. While it is in Canada a matter of pride to have a very numerous family, in our Norman province the birth-rate is now inferior to the rate of mortality. This is the result of selfishness or of immorality. It is probable that if Canada had remained a French colony to the present day, the influence of our manners would have made itself felt there by the constant personal intercourse, by the action of literature and art and the drama, and the Canadians would no longer be regarded as an eminently prolific race."

The maps show the Western Sudan, Saint Louis in 1854, Saint-Louis in 1885, and Dakar in 1850 and in 1888.

Russian Explorations, 1725–1743. Vitus Bering: the Discoverer of Bering Strait. By Peter Lauridsen. Revised by the Author, and Translated from the Danish by Julius E. Olson. With an Introduction to the American Edition by Frederick Schwatka.

Chicago, 1889.

Mr. Lauridsen's book is rather a defence than a biography of Bering. The Danish navigator, who is called a German in the last edition of the Encyclopædia Britannica, has not always met with justice at the hands of men. He was harshly dealt with by the Russian Senate and the Admiralty; and Captain Cook was the first to recognize his worth. Cook's judgment has been approved by many distinguished seamen of the last hundred years, but others, and foremost among them Baron Nordenskiöld, have roused Mr. Lauridsen's wrath by their treatment of Bering. The tone of controversy pervades the present book to an unpleasing degree, and the generous heat of the author, or the translator, carries him beyond bounds. Mr. W. H. Dall is one of Bering's supposed enemies, and the heading of Chapter XVII. mentions him in these words: "Dall, the American writer, reprimanded." What is the relation between the two writers that gives to Mr. Lauridsen the authority to *reprimand* Mr. Dall?

Mr. Lauridsen would have done better work if he had approached his subject in a calmer frame of mind; and there was the greater inducement to do this that Fortune has not, on the whole, been cruel to Bering. The sea and the strait that he discovered bear his name, and the glory of planning the great Northern Expedition—extravagantly called by his biographer "the greatest

geographical enterprise that the world has hitherto known"—belongs to him. These are titles to fame, if fame has any value, and the man who has won them is beyond the need of defence.

The folding maps in the volume present: Bering's Chart of his First Voyage, Berch's Chart of 1728, Müller's Map of Bering Peninsula, 1758, Kaiak Island, Spangberg's Chart of the Kuriles and North Japan, 1738–39, Bering's and Chirikof's Expeditions to America, 1741, and Fr. Lütke's Map of Bering Island, 1827.

Le Congo Français du Gabon à Brazzaville. Par Léon Guiral, ancien attaché à la Mission Scientifique de l'Ogooué et du Congo. Préface par M. J. Künckel d'Herculais. Ouvrage orné de gravures et d'une carte.

Paris, 1889.

Léon Guiral died of the African fever at the end of the year 1885.

He was twenty-seven years old and had already done good work, both as a naturalist and as an explorer, in the Congo region. The present volume is made up of his notes, published almost as he left them, and they testify to very uncommon qualities in the writer. The chapter on the Batékés, who live on the water-shed between the Ogowe and the Congo, seemed to Dr. Hamy so remarkable that he asked permission to print it in the *Revue d'Ethnographie.*

Another tribe, or nation of Batékés, inhabits the two sides of Stanley Pool, known to the natives as Nkuna, but there is nothing, except the name, common to these and to the Batékés of the Ogowe.

At Stanley Pool M. Guiral was received with the

greatest cordiality as the "son of the Commandant" (de Brazza). This was on the right bank of the Pool, where there were no European establishments, and the natives had the feeling that they were neglected by the white men, of whom they knew only de Brazza and Guiral, and Stanley. M. Guiral told the chiefs that the French were coming to settle in the country. "Let them come," was the answer; "this land belongs to the Commandant. He is the only one who is on our side. Bolimuntari (Stanley) killed some of our people. If he comes here he will find the villages deserted." The Batékés on the left bank of the Pool cherished a grudge against Stanley for the severe vengeance he had taken upon them; but M. Guiral remarked that all the Batéké chiefs did not share this sentiment. This was one of the frequent indications of the European rivalries on the Congo, and their effect on the natives.

It was only a short time after his talk with the chiefs that M. Guiral met Stanley, at Ngubela, on the left bank of the Congo. There was a great crowd round the explorer's hut. Guiral entered. Stanley rose, shook hands with his visitor and gave him a seat. There were some whites and a number of native chiefs in the hut.

One of these, Ngubela, made himself at home and even pushed his stool in between Stanley and Guiral. The conversation was in French, which Stanley spoke "well enough to be understood." Two of Ngubela's children ran in and out, fanning their father from time to time with journals which had been given to them, and the chief occasionally requited this service with a mouthful of beer, contributed in an unconventional way from the draught he had just taken.

Stanley spoke of de Brazza with a good deal of bitterness, and Guiral, to avoid committing himself on a subject so delicate, feigned ignorance of the incidents mentioned. He adds: "I saw well enough that Stanley had heard of my coming, and had brought together the crowd of various tribes and the chiefs to impress me with the evidences of his power in the country."

Invited to a second interview, Guiral maintained the same reserve, though Stanley plied him with questions. They met a third time, and that evening Stanley was extremely gay, full of talk and very cordial in manner.

"Stanley's hut," says Guiral, "was like an arsenal. There was a gun under his pillow, and above his bed hung rifles, a Martini, a Snyder, and two Winchesters, besides a shot-gun.

"He is continually on his guard. He lives alone in a hut that stands by itself, and he eats alone. He keeps an impassable distance between himself and his people. He is a veritable military leader, with his lieutenants and his soldiers, and his stated hours for reports, after which he must not be disturbed except for some grave matter. He is severe, and the blacks tremble in his presence. I do not know whether he commands the attachment of those about him. I speak principally of the Europeans; but it is certain that he exercises a great influence over all the members of the expedition, from the Belgian officer to the last Kruman. All have the most absolute confidence in him."

These interviews took place in 1882, and M. Guiral gives the following picture of Stanley: "He is of middle height, narrow-shouldered, and with a rather thick neck. His almost white hair contrasts with a close-cut,

irreproachably black moustache. He has large and prominent eyes and a keen glance, which becomes fixed when he questions the person with whom he talks. At the least excitement his generally pale face flushes."

A Concise Dictionary of the Principal Roads, Chief Towns and Villages of Japan, with Populations, Post-Offices, etc.: Together with Lists of Ken, Kuni, Kôri, and Railways. Compiled from Official Documents by W. N. Whitney, M. D. Interpreter of the U. S. Legation, Tōkyō. Tōkyō, Yokohama, Shanghai, Hongkong and Singapore.

8*vo.* *London, 1889.*

(*from the Author.*)

This little volume, which contains in all but 400 pages, is nothing less than an epitome of the Japanese Empire.

The preface clears up many doubtful points. Since the time of the Restoration (1868) the government has been an absolute monarchy, conducted by a Cabinet appointed by the Emperor. Certain modifications prepared the way for the new constitution, promulgated February 11th, 1889, to take effect January 1st, 1890.

The Government will then consist of the Emperor, the Cabinet and the Diet, this comprising the House of Peers and the House of Representatives. The first Session will be held in 1890.

The main divisions of the Empire are forty-six in number, *viz.*: Three imperial cities (Tōkyō, Kyōto, and Ozaka), forty-two prefectures, and one territory (Yesso and neighboring islands).

The *Ken* are prefectures, the *Kuni* provinces (no longer politically recognized), and the *Kôri* counties.

There are tables of Japanese weights, measures, and money, a sketch of the Japanese syllabary and orthography, and an appendix, containing the constitution of the Empire, the law for the organization of cities, towns and villages, and statistical information respecting territory, population, commerce, industry, justice, army and navy, religion, and other subjects.

If a constitution could decide such matters, some things in Japan would be beyond the reach of change. The Emperor, at least, possesses all reasonable security against the fate of Dom Pedro II. in the declaration made in Chapter 1, Article 1: "The Empire of Japan shall be reigned over and governed by a line of Emperors unbroken for ages eternal."

The area of the Empire is 24,794.36 square *ri*, each of 5.9552 square miles. The proportion of cultivated land is, in Nippon, 59.25 per cent., in Shikoku 4.76, in Kyūshū 11.41, and in Hokkaidō 24.58 per cent.

The population numbered on the 31st Dec., 1887, 36,069,007, almost equally divided between the sexes.

There were in 1886 6,611,461 children (3,472,787 boys and 3,138,674 girls) of age to attend school. Of these, 3,063,186 (2,152,767 boys and 910,419 girls) were actually in attendance, and 3,548,275 (1,320,020 boys and 2,228,255 girls) did not attend school.

TITLES OF PAPERS IN GEOGRAPHICAL JOURNALS.

AMSTERDAM—*Kon. Nederlandisch Aardrijkskundig Genootschap, Tijdschrift.*

Places of more than 10,000 Inhabitants in the Netherlands on the 1st January, 1889, with the Absolute and the Relative Increase during the

year 1888—Communications relating to the Scientific Exploration of Flores and the Ki Islands—Some Particulars Concerning the Mongols, from Przjevalsky's Fourth Journey in Central Asia—The most Important Travels of Netherlanders in the Nineteenth Century and their Chief Geographical Works for the same Period—On the Indian Question in the United States—The Paris Geographical Congress, 1889—The West Coast of Atjeh—Engano (west of Sumatra), its History, Inhabitants and Products—A Word on the Map of Samarang—The Plans for Draining the Zuyder Zee—Voyage of the Austrian Corvette *Zrinyi* in the West Indies; with a Supplement—Amendments and Additions to the "Journeys and Explorations in North America"—Some Observations on Mammalia, made by R. Schuiling in "Wallace's Boundary Line a Continental Limit"—Development of our Acquaintance with the Pamír Region.

BERLIN.—*Gesellschaft für Erdkunde, Verhandlungen.*

Schweinfurth's Travels in Arabia Felix—Captain Kund in the Southern Kamerun—Dr. Walther's Report on the Results of a Voyage to the East Indies in the Winter of 1888–89—Dr. Philippson's Peloponnesian Journey in the Spring and Summer of 1889—Dr. Warburg's Travels in Formosa—Dr. Hettner's Fourth Report on his Travels in Peru and Bolivia.

Zeitschrift.

The Determination of Geographical Position by the

so-called Method of Statical Lines—On Projections of the Map of Africa—The First Journey of a European to Damaraland—The Wanyamwezi—Dr. Nansen's Official Report to Counsellor Gamél, in Copenhagen.

Deutsche Kolonialzeitung.

The Congo State and the Arabs—The German Emin Pasha Expedition—The Question of Malaria from the Point of View of Tropical Hygiene—What is to Become of the Freed Slaves?—The Somali—The Situation in East Africa—Transactions of the Section for Medical Geography, Climatology and Tropical Hygiene at the Sixty-second Congress of German Scientists and Physicians—The Three-Americas Congress—The German Commercial and Plantation Society in the South Sea—A New Protectorate in East Africa—The Colonial Situation—From German Vituland.

BRUSSELS.—*Société Royale Belge de Géographie, Bulletin.*

The Topographical Evolution of a Great City—Recent Discoveries in Egypt (Jules Leclercq)—Narrative of the Attempt at Flemish Colonization in Mexico—The Samoan Islands—The Lower Congo—Tierra del Fuego and the Falkland Islands—The International Geographical Congress in Paris, 1889—An Excursion in Campine—Léopoldville—The Province of São Paulo, Brazil—The Universal Hour and the Initial Meridian.

Le Mouvement Géographique.

The Italian Protectorate in Abyssinia and at Shoa

—News of Stanley—Tekna (North-Western Sahara)—Stanley and Emin—Commercial Progress on the Congo—A New English Colony: Zambesi—The Portuguese and the English in Nyassaland—The Congo Railway—The Lower Congo—Missions on the Congo—The Conquest and the Loss of the Egyptian Soudan—Stanley and the Relief of Emin Pasha.

BUENOS AIRES.—*Instituto Geográfico Argentino, Boletin.*

The Naturalist in Brazil—Customs of the Mataguayo Indians—The Chaco and its Rivers—American Linguistic Studies.

Sociedad Geográfica Argentina, Revista.

Communications to the International Geographical Congress—The Territory of Formosa (between the Paraguay, the Pilcomayo and the Rio Bermejo)—In the Chaco—The Territory of the Chaco Austral.

EDINBURGH.—*The Scottish Geographical Magazine.*

Narrative of an Exploring Expedition to the Eastern Part of New Guinea.—The Present and Future of Queensland (Carl Lumholtz)—The Physical Conditions of Barents Sea—On the Achievements of Scotsmen during the Nineteenth Century in the Fields of Geographical Exploration and Research—The Cocos-Keeling Islands—On the Temperature of the Tidal Estuaries of the South-East of England—Report to Council on the British Association Meeting at Newcastle, 1889.

FLORENCE.—*Sezione Fiorentina della Società Africana d'Italia, Bullettino.*

The Western Somali—Opia and the Italian Protectorate on the Somali Coast—A Reconnoissance up to Asmara—Italy in Eastern Africa.

GENEVA.—*L'Afrique Explorée et Civilisée.*

General Survey of African Events—Chronicle of Slavery and Reports of the Missions—Tanganyika—Letter from the Zambesi.

GOTHA.—*Petermanns Mitteilungen.*

The Adai-Choch in the Central Caucasus—The "Rigi" in the Cascade Mountains—Ice-Caves—Kangaroo Island—The Hydrographic Characteristics of the Rudolf Lake Region—Orotava Valley in Teneriffe—The Latest Earthquake in Greece—British North Borneo The Map of Usambara—Bokhara at the Beginning of a New Epoch—Journey in Southern Iceland—Surveys and Cartography in Netherlands-India.

LONDON.—*Royal Geographical Society, Proceedings.*

Lake Tanganyika—The Bijouga or Bissagos Islands, West Africa—The Geographical Congress in Paris—Geographical Co-ordinates in the Valley of the Upper Nile—Wind-Action in Egypt—An Expedition across Australia from South to North, between the Telegraph Line and the Queensland Boundary, in 1885–86—Explorations and Ascents in the Caucasus in 1889.

MADRID.—*Sociedad Geográfica de Madrid, Boletin.*

Roman Roads between Toledo and Mérida (by

Don Francisco Coello)—Authentic Notices of the Famous River Marañon and the Apostolic Mission of the Society of Jesus, of Quito, in the Vast Forests of that River. Written in 1738 by a Missionary of the Society, and now Published for the first time by Marcos Jiménez de la Espada — Brief list of the Maps and Plans in the Private Library of the King (Cesáreo Fernandez Duro)—Edrisi's Geography of Spain (Don Eduardo Saavedra).

Sociedad Española de Geografía Comercial, Revista.

The English at Puerto Cansado (on the Atlantic Coast of the Sahara) — Spanish Missions in Africa — The Anti-Slavery Congress — New Markets for Spanish Industries—The Samoan Group—The Rif Question—The Geographical Congress in Paris—Colonization of Mindanao —The Pennsylvania State Fair in 1888.

MANCHESTER—*Manchester Geographical Society, The Journal of the.*

Peking and the Pekingese—Fernando Po, West Africa—The Sea and Shores of Azov—Notes of Travel from Shanghai to St. Petersburg—Correspondence : An Island in Lake Nyassa, From Newcastle to Yenesei, the East African Question, the Slave Trade in Central Africa.

MILAN—*L'Esplorazione Commerciale.*

Ostrich Farming—Italian Travellers—Correspondence : From Rome ; from Barbadoes—French Guiana and M. Coudreau's Explorations—The Panama Canal.

PARIS—*Société de Géographie, Compte Rendu.*

Remarks of the President on the Death of Gen. Faidherbe—Letter of the Lisbon Geographical Society announcing its intention to celebrate in 1897 the Fourth Centenary of Vasco da Gama's Discovery—Reception of the Remains of de Langle, the Companion of La Pérouse—Route from Russia in Europe to the Amur River—Ostrich Farming in the Sahara—Maistre's Travels in the Centre and West of Madagascar.

Bulletin.

Report on the Work of the Society and the Progress of Geographical Science in 1889 (by M. Ch. Maunoir)—The French Sudan, 1887–1888 (by Lieut.-Col. Galliéni).

La Géographie.

Norkenskiöld—Colonial Movement among the Nations—The Part of Topography in History—The Washington Congress—The Gorges of the Tarn and Montpellier-le-Vieux—The Future of Tonkin—The Italians in Ethiopia—The French Sudan—The New Hebrides—The Republic of Hayti—The New Survey of France—The Transvaal—The Brussels Conference—Portugal and the English Machinations in Africa.

RIO DE JANEIRO.—*Sociedade de Geographia de Rio de Janeiro, Revista.*

Geographical Glance at the Province of São Paulo—Explorations in Matto-Grosso—The International Congress in Paris—Immigration into Brazil—Meteorology.

ROME.—*Società Geografica Italiana, Bollettino.*

Shoa and the Neighboring Countries—Studies in Topographical and Hydraulic Geology—The Island of Nias (W. Coast of Sumatra).

VIENNA.—*Kais. Königl. Geographischen Gesellschaft Mittheilungen.*

On the Columbus Literature—The Western Portion of the Illyrian Mountain Region—The Historical Geography of the Black Sea—Hong-Kong, Canton and Macao.

Deutsche Rundschau für Geographie und Statistik.

The North-Western Boundary of India—Meteorology of Brazil—A Vacation-Trip in New Zealand—Dakota—The Portuguese in East Africa—Jerusalem—The Geographical Distribution of the living Representatives of the Family *Cervus*.

WASHINGTON.—*National Geographic Magazine.*

Irrigation in California—Round About Asheville—A trip to Panamá and Darien—Across Nicaragua with Transit and Machete (R. E. Peary, Civil Engineer, U. S. N.).

WASHINGTON LETTER.

WASHINGTON, DECEMBER 10, 1889.

Commander Henry F. Picking has been designated to succeed Lieut. G. L. Dyer as Chief of the Hydrographic Office of the Bureau of Navigation. Under Lieutenant Dyer and his immediate predecessor, Commander Bartlett, the methods and results of the Hydrographic Office have been made available and practically useful to the public. In addition to the branch offices at New York, Boston, Philadelphia, Baltimore, New Orleans and San Francisco, new branches have been established at Portland, Oregon, Norfolk, Va., and Savannah, Ga. Other offices will be located as soon as the condition of appropriations will admit. During the past year sixty-six new charts have been published. The general localities covered are in Newfoundland, Nova Scotia, West Indies, Gulf of Mexico, South America, California, and islands in the Pacific and East Indies. In addition, the publication of the great circle sailing gnomonic charts of the North and South Pacific and Indian oceans completes the set of these charts for the great oceans. The charts of the North and South Pacific and Indian oceans will be found particularly useful; that of the North Pacific, for the ocean travel between the United States and the China Sea; those of the Indian and South Pacific in the New Zealand and Australian trade. All who use these charts in connection with a knowledge of the prevailing winds and currents of

the ocean gain daily advantage in the great sea-routes. There are now eight hundred different Hydrographic Office charts, and nearly thirty thousand copies were issued during the past year.

Especial attention is being given by the Office to the subject of marine meteorology. Within the last few years this science has made vast progress, and although ocean storms differ in certain marked ways from those on land, yet it is only a difference of degree. This Division under the charge of Mr. Everett Hayden is now thoroughly systematized, and it is expected that the present permanent force of marine meteorologists will be able gradually to develop Pilot Charts of all the oceans, similar to that now issued monthly for the North Atlantic. Probably no strictly nautical publication has ever had a greater success than this chart. The issue of March, 1888, and the supplements for February and August of the same year were exceptionally popular. The March chart contained diagrams and directions for the use of oil in calming heavy seas, taken from Captain Karlowa's prize essay on the subject. It was distributed amongst all classes of sea-going people, and was the means of saving many lives and much property during the very stormy months of March and April and the early part of May. The use of oil for the purpose of smoothing dangerous seas is becoming universal, but it is believed that much may still be learned as to the most suitable kind of oil and the best methods and appliances for using it for this purpose. The February supplement gave a very complete account of the remarkable cruise of the famous derelict schooner *W. L. White*, which was abandoned off the capes of the Delaware dur-

ing the March "blizzard," and crossed the Atlantic in an erratic track in ten months and ten days. She was reported forty-five times, and for six months remained off the Grand Banks, directly in the track of transatlantic steamers. The August supplement was devoted principally to the history of the raft which broke away from the steamship *Miranda* in December, 1887, and became such a great menace to navigation. It experienced a series of severe Northwest gales which broke it up and drove the scattered portions across the Gulf Stream. The drift of the logs was indicated graphically and discussed in the accompanying text. It afforded an interesting illustration of the direction and force of the prevailing winds and currents in the North Atlantic.

Lieut. J. A. Norris gives in detail in the Annual Report of the Hydrographer for 1889 an account of the expedition which left New York for Vera Cruz in November, 1888, for the telegraphic determination of longitudes in Mexico and Central America. The results of this valuable work are about ready for publication. The same party is preparing for further labor in the West Indies and on the Spanish Main. A similar expedition in 1883 determined the position of Vera Cruz in latitude and longitude; and another in 1884 fixed the position of La Libertad in Salvador.

In the preparation of the new charts for Sunda Strait, Singapore and Rhio Straits, and the passages from Java into the China Sea, the Hydrographic Office has adopted a new system for the spelling of Malay names, which it is proposed to follow in future publications relating to regions for which Malay has principally supplied the nomenclature. The new system is based

on the Dutch orthography of Malay, as found in the latest publications of the Hydrographic Office at Batavia.

The latest Batavian spelling of a Malay name is transcribed in accordance with the following rules:

oe, the vowels oe are changed to u simply; as Batu for Batoe, Sumur for Soemoer, etc.

y is substituted for j when this letter is not preceded by d or t; as, Payung for Pajoeng, Tamuyang for Tamoejang, etc.

j is substituted for dj; as, Jati for Djati, Panjang for Pandjang, etc.

ch is substituted for tj; as, Kechil, for Ketjil, Sanchang for Santjang, Chipanchur for Tjipantjur, Chilachap for Tjilatjap, etc.

i is substituted for ie in words ending in that syllable, the e being mute after i; as, Mandiri for Mandirie, Kali for Kalie, Banyuwangi for Banjoewangie, etc.

In regard to merely descriptive names, as tanjong (cape or point), pulo (island), gunong (mountain), gusong (shoal), etc., the practice is in favor of translating them, except in cases where, for reasons of euphony or long usage, the Malayan appellation may be retained. Also, names which have long been written in a form that has become familiar to American eyes will not be changed, although the spelling may not be in accordance with the adopted system, as Anjer, Singapore, Banka, and a few others.

Older Batavian charts are not relied on for correct spelling, as they show many differences from the more recent Batavian charts.

In Malay literature there is a great diversity in the manner of spelling many words, and the pronunciation of the same name varies according to locality. The Malay alphabet consists of thirty-four letters, and the English alphabet does not therefore accurately correspond with it without additional symbols, which it is not desirable to introduce on nautical charts.

It is for these reasons impracticable to prescribe absolutely correct rules of pronunciation, and as the rules should be simple, only an approximation to the true sound is aimed at in the system here given, which, in the main, will be found to correspond with that proposed in the British Admiralty China Sea Directory, Vol. I. 1886, pages v and vi.

PRONUNCIATION OF VOWELS AND DIPHTHONGS.

a, as in Java, Banka.
e, as in Pernambuco, Mexico.
i, as in Chili, Mississippi.
o, as in Formosa, Bangkok.
u, as in Sumatra, Peru.
ai, as in Shanghai, or as I in Ireland.
au, as ow in Howard, or as ou in house.
ao, but slightly different from au, as in Macao.
ei, but slightly different from ai, or nearly as the ie and ye in die or dye.

PRONUNCIATION OF CONSONANTS.

b, *d*, *f*, *h*, *j*, *k*, *l*, *m*, *n*, *p*, *r*, *s*, *t*, *v*, *w*, *x* and *z*, the same as in English.
ch, as in Churchill, Chichester.
g, is always hard, as in game.

y, as in yard, yes.
ng, as in finger, singer.
gk, as in Nang-ka (the g should never be dropped, as in Banka for Bangka, the syllable ending in g being usually the root of the compound or derivation).
kh and *gh* are oriental gutturals, as in Khan, Ghazi.

ALASKA.—There are two chapters of interest in Capt. Healy's account of the *Corwin's* cruise in the Arctic Ocean in 1884, recently printed.* (1) Descriptions of Bogoslov Island and the new volcano in Bering Sea, and (2) Narrative account of the exploration of the Kowak River.

According to Surgeon Yeman of the *Corwin's* party, the newly formed portion of Bogoslov Island lies in latitude 53°, 55′, 18″.5 N., and longitude 168°, 00′, 21″ W. It is nearly circular in shape, and distinctly volcanic in origin. Two other navigators saw this island in 1883, but the party from the *Corwin* was the first to land. It is not definitely known when the new land arose from the sea, but it was probably in the year 1882.

As seen from the deck of the *Corwin* in 1884, it had the appearance of a dull gray, irregularly shaped hill, about five hundred feet in height; from the sides and summit of which volumes of steam were rising. A closer examination of what appeared to be patches of vegetation revealed only collections of condensed sulphur. No animal life whatever was found; nor could any satisfactory examination of the fissures be made owing to steam,

*Report of the cruise of the Revenue Marine Steamer *Corwin*, in the Arctic Ocean, in the year 1884. 4to, Washington, 1889.

fumes and heat; it being hot enough in one of the crevices through which steam was escaping to melt the solder fastenings of the thermometer, and expand the mercury sufficiently to burst the bulb. The discharge from the vents was perfectly regular, unaccompanied by much, if any, noise.

The explorations of the banks of the Kowak River are the first ever recorded. The steam-launch started from Cape Krusenstern July 8th and returned August 30th. It traversed 370 miles up river and 204 miles in exploring Lake Selawik and its region. The prime object for which the expedition was sent, viz.: the exploration for a lake which was supposed to exist at the headwaters of Kowak River, or a ready means of communication between the settlements on the Yukon River and those on the shores of the Arctic Ocean, was not accomplished; but the narrative of Lieut. J. C. Cantwell abounds with interesting details of the examination of the topography of the surrounding country which resulted in several important changes being made in the maps of that section. Ethnological and natural history notes are treated in separate chapters.

Commander C. H. Stockton of the *Thetis* reports that during the cruise of that vessel in Bering Sea, no evidence was seen of the existence of either of the two reported islands southwestward of the Pribyloff Islands, or of a shoal indicated on the chart as doubtful in about latitude 57° 30′ N., Longitude 167° 25′ W.; also that the concurrent testimony of several Revenue Marine officers and the commanding officers of the Alaska Commercial Company's steamers is against the existence of this shoal or the islands.

From the same source the following late information relating to the north coast of Alaska, from Point Barrow to Mackenzie Bay is derived. On August 8, 1889, the *Thetis* started on a cruise to the eastward of Point Barrow, which extended as far as Mackenzie Bay. In the main, the contour line of the coast as shown on Hydrographic Chart No. 912 is correct. The coast line, however, is out of latitude in various places, being generally plotted several miles too far to the northward. This is especially the case in the vicinity of Flaxman's Island and the eastern part of Lion Reef. The other more prominent outlying shoals and islands are mostly correct in latitude, but their indicated positions with respect to the main land and their general directions are in many cases erroneous. The soundings are relatively well placed as regards the coast, but the absolute positions are often wrong, as indicated on the chart. Ice is always found along and near the coast between Point Barrow and Herschel Island, the heavier ice resting either upon or in the close vicinity of Tangent Point, Cape Halket, Lion Reef, Manning Point and near Herschel Island. With westerly and northwesterly winds, the pack ice is likely to come down upon the shore at one or all of these points. A northeasterly wind in turn clears the ice off the coast and opens a lane. Vessels going to the eastward after the first week in September, or remaining to the eastward after that time, should be prepared for wintering.

Tangent Point is low and flat, with many small lagoons. It is represented by the natives as being almost entirely the delta of a river, most probably the Ik-puk-puk. The shoal off Cape Halket reported by Captain Knowles,

of the whaler *Pacific*, was not met with by the *Thetis*, but several whaling vessels this year report it at a distance of three miles N. 81° E. from what is represented as an island just inside of Cape Halket. It is stated that this island, which lies close inside and to the eastward of Cape Halket, is connected by a low sandy neck with the main land.

Pelly Mountains were not found by the *Thetis*, and certainly do not exist where placed by the charts. The concurrent testimony of the whaling masters who know the locality, and the natives who hunt in that neighborhood is strong evidence against the existence of these Mountains. In going eastward the Franklin Mountains were the first ones met. From the point of view of the *Thetis* they seemed continuous with the Romanzoff Mountains.

Several islands, one of them about three miles long, extend from Return Reef to the sand island shown off the Colville River, in Harrison Bay. These islands are not shown on the Hydrographic Office chart, and appear to have no name among the natives, and they have been designated "Thetis" islands. They number, as far as seen, four, and run in a general way parallel to the main coast line. The group of small islands extending about east and west off Yarborough Inlet are really the terminal islands at the western end of Lion Reef. Being about midway between Lion Reef proper and Return Reef, they have been designated "Midway" Islands. The westernmost of these islands is in latitude 70° 28′ N., longitude 147° 53′ W., and has been named "Cross" Island.

On Collinson Point and on Barter Island are to be found during the summer, rendezvous and encampments

of Eskimo, meeting there for the purpose of trade, similar to the same rendezvous in Kotzebue Sound. Here the eastern and western Eskimo, or more correctly the western and the middle or Mackenzie River Eskimo meet, also the Luces or Rat Indians, who come from the vicinity of the Porcupine and Rat rivers, and who have a principal rendezvous and habitation at the Rampart Station. They are generally Christians and inoffensive. There is no permanent settlement either at Collinson Point or Barter Island.

Herschel Island is about five hundred feet in height, has a rounded outline, sloping gradually from the centre on all sides, and shows an appearance of former glacial action. The vegetation is confined to grasses and small arctic flowers. On the east side of the island there is a small snug harbor, named Pauline Cove. An open bay, named Thetis Bay, on the same side of the island, was found by the *Thetis* and three steam whalers to be a fairly good anchorage with westerly and northwesterly winds. There is a rise and fall of the tide amounting to about three feet in the vicinity of Herschel Island.

The schooner *Norway*, while cruising in July, 1889, in Bering Sea, passed near to the charted position of the "supposed island" southward of the Pribyloff Islands. The weather was quite clear at times, but no island was seen. When the vessel was in Amoughta Pass, Aleutian Islands, about midway between and on a line joining the south point of the eastern extreme of Seguam Island with the north extreme of Amoughta Island, the pass between Tchegoula Island and Amoughta Island was well open, showing Tchegoula Island to be further

to the northward and westward than is indicated on the charts.

BOUNDARIES.—When the Secretary of State in March last submitted to Congress certain documents and maps relating to the undetermined boundary line between Alaska and British Columbia, being the papers and memoranda of Mr. W. H. Dall and Dr. George M. Dawson, referred to in my letter of June 15, 1889, the documents alone were printed, without the maps. The entire report, documents and maps have been recently issued.*

It will be remembered that during the sessions of the Fisheries Conference in Washington in 1887–88, it was suggested that an informal consultation between some person in this country possessing knowledge of the questions in dispute, and a Canadian similarly equipped, might tend to facilitate the discovery of a basis of agreement between the United States and Great Britain, upon which a practical boundary line might be established. Mr. Dall and Dr. Dawson were selected as principals in the consultation.

The inclosures with the Report of the Secretary of State are as follows:

1. Mr. Dall to Mr. Moore, January 3, 1888.
2. Dr. Dawson to Sir Charles Tupper, February 7, 1888.

2*a*. Same to same, February 11, 1888.

3. Mr. Dall to Mr. Bayard, February 13, 1888.
4. Same to same, December 19, 1888.
5. Memorandum on the Alaskan boundary, by William H. Dall, A. M.

* Senate Ex-Doc. No. 146, 50th Congress, 2d Sess.

6. Supplementary memorandum on the views of General Cameron as submitted in the letter of Dr. George M. Dawson to Sir Charles Tupper, by William H. Dall.
7. Convention between United States and Russia, April 5–17, 1824.
8. Anglo-Russian treaty, 1825.
9. American-Russian treaty, 1867.
10. Two tracings by the Coast Survey, showing the features of the region on the north shore of Portland Inlet, near its mouth.
11. British Admiralty Chart, No. 2,431, showing the latest British survey of Portland Inlet.
12. Chart 3 of French edition of Vancouver of 1799; covering region north of the 45th parallel of latitude.
13. Chart 7 of same, covering territory between parallels 54° and 57° north latitude.
14. Official Canadian map of British Columbia, 1884.
15. Dawson's Canadian map, 1887.
16. Dawson's Canadian map, 1887, showing conventional lines proposed by Canada.
17. Canadian map, January 23, 1888.

Advices to the latter part of August have been received from the Coast Survey party sent out at the instance of the Secretary of State to make a preliminary survey of the frontier line between the 141st meridian of west longitude at or near where it crosses the Yukon River. The points of destination had not been reached. Captain McGrath writes under date of August 19th that he was then two hundred miles beyond that point on the Yukon, which is half way between St. Michael's

and where he expected to go. The river much resembled the Mississippi. Indian settlements were numerous, the mountains magnificent, and the forests luxuriant. The ground was frozen hard anywhere below ten inches, but in spite of this the weather was so warm that every man was going around in his shirt sleeves.

The parties separated at Fort Yukon on the 2d of July. Turner and his party went up the Porcupine in a steamer—the first one ever seen on that river. Fort Yukon is but a name. There is not a stick of one of its houses left. The English used to think it belonged to them, but a survey showed that it was twenty-five miles within our territory, and as there was no business to warrant occupation, the houses of the Hudson Bay Company were allowed to go to ruin,

Under date of August 21st Captain McGrath writes that he was four or five miles outside of the United States line, and did not expect to get any more letters out this year nor in the spring.

Henry L. Whiting, of the Coast Survey, has made a report as referee on the disputed boundary line between Maryland and Hog Island. The report awards the disputed territory to the State of Maryland. After reviewing the original charter which adopted the high-water mark as the boundary line and the award of the arbitrators in 1877 which changed the line to low-water mark, Mr. Whiting concludes as follows: "I am prepared to say, on the part of the Coast and Geodetic Survey, that, according to the text of the award of the arbitrators of 1877, as descriptive of the boundary line between Maryland and Virginia, no mathematical or physical construction can be put upon the meaning of said descrip-

tion which will locate and define this cognate boundary line and low-water mark in any other place or make it conform to any other course of the river than that which they have ascertained and determined to be the low-water mark on the south shore (right bank) of the Potomac River, as marked and shaded in red upon the coast chart No. 33 of the United States Coast Survey, which is filed as part of the said award and explanatory thereof. This clearly illustrates the intended location of the boundary line and conforms to the terms and meaning of the award."

Information has been received from the joint boundary commission of New York and New Jersey, that it is proposed to erect at once a permanent monument at the turning point in the boundary line between New York and New Jersey in Raritan Bay. The monument will be situated 1 5-8 miles S. 64° 21′ E. from Great Beds light-house, and will be marked "State Boundary Line, New York and New Jersey." It will consist of an iron beacon surmounted by a ball and spindle, painted white, the whole structure being thirty-seven feet above mean low water, and having a circumference of ripraps, the diameter of which will be 100 feet. Position: Latitude, 40° 28′ 35″ N.; longitude, 74° 13′ 32″ W.

IRRIGATION.—The Director of the United States Geological Survey has notified the Secretary of the Interior of the selection of the following sites for reservoir purposes, situate in the several States and Territories designated, all of which selections have been approved by the Department:

Clear Lake, Lake County, California, together with

all lands situate within two statute miles of the borders of said lake at high water. Letter dated June 7, 1889.

Independence Lake, Nevada County, California, together with the lands bordering thereon. Letter dated August 5, 1889.

Donner Lake, Nevada County, California, together with the lands adjacent thereto. Letter dated August 5, 1889.

Webber Lake, Sierra County, California, together with the lands bordering thereon. Letter dated August 5, 1889.

Twin Lakes, Lake County, Colorado, together with all lands situate within two statute miles of the borders of said lakes at high water. These lakes are in close proximity to each other. Letter dated July 8, 1889.

Sampitch River, San Pete County, Utah, the lands included in said proposed site being situate in sections 16, 21, 28, 32 and 33, township 18 south, range 2 east. Letter dated July 18, 1889.

Sevier River, Millard County, Utah, the lands therein being situate in sections 2, 3, 10, 11, 14 and 15, township 17 south, range 7 west, Salt Lake meridian. Letter dated July 26, 1889.

Bear Lake, Utah, together with all lands adjacent thereto and within two statute miles of the borders of said lake at high water. Letter dated July 19, 1889.

Bear Lake, Bear Lake County, Idaho, together with all lands situate within two statute miles of the borders of said lake at high water. Letter dated July 19, 1889.

Montana.—Sections 21 and 22 township 9 north range 2 east; section 12 township 9 north, range 2 west; sections 7 and 8, township 9 north, range 3 west; sections

18 and 19 township 18 north, range 6 west; sections 13 and 24, township 18 north, range 7 west; sections 5 and 8, township 22 north, range 4 east; and of township 22 north, range 3 east; all of township 26 north, range 7 west; and section 17, township 25 north, range 6 west. Letter dated July 19, 1889. These lands are located in Meagher, Jefferson, Lewis and Clarke and Choteau counties.

Rio Grande River, above the site of El Paso, N. Mex., as an international dam and reservoir: and public lands on the right bank of the Rio Grande River, between the Mexican boundary line and a point 20 miles above that boundary line and extending 4 miles west of said right bank. Said lands are situate in townships 26, 27 and 28 south, range 2 east, and townships 26 to 29, inclusive, south, range 3 east, Las Cruces district. Letters dated July 13 and 30, 1889.

CONGRESS OF AMERICAN NATIONS.—The discussions of the congress of American nations promise to extend well into the summer of the year 1890. Since the 18th of November time has been chiefly occupied with adjournments and the consideration of rules, which also provide for the appointment of the following committees:

An executive committee of five members, to receive and record nominations of Vice-Presidents from the several delegations to designate the officer who shall preside in the absence of the President; to superintend the publication of the protocols and reports of the proceedings, and to provide generally for the conduct of business;

A committee on customs union, composed of five

members, to consider and report a basis for an American Customs Union, and the advisability of a division of the subject into sections, according to the geographical situation of the countries represented in the conference and the similarity of interests involved ;

Three committees of five members each to consider and report upon the best means of extending and improving the facilities for transportation and postal and telegraphic communication between the several countries represented that border on the Atlantic Ocean, the Pacific Ocean, and the Gulf of Mexico and the Caribbean Sea, respectively ;

A committee of five members to consider and report on the subject of railway communication between the several countries represented ;

A committee on Customs Regulations, composed of five members, to consider and report upon the best method of improving and simplifying customs regulations in the several ports of the countries represented ;

A.—Formalities to be observed in the importation and exportation of merchandise ;

B.—Classification, examination and valuation of merchandise ;

C.—Methods of imposing and collecting fines and penalties for the violation of the customs and harbor regulations ;

A committee of five to consider and report upon the best method of securing uniformity of lighthouse, pilot, and other harbor dues ;

A committee of three to consider and report upon the adoption of a uniform system of weights and measures ;

A committee of seven to consider and report upon the best method of establishing and maintaining sanitary regulations in commerce between the several countries represented;

A committee of three to report upon the best method of protecting patents, publications, trade marks and right in commerce between the countries represented;

A committee on extradition, composed of three members, to consider and report upon the establishment of a general convention between the countries represented;

A committee on monetary convention, consisting of seven members, to report the basis of a monetary convention between the countries represented in the conference;

A committee on banking, to consist of five members, to report a method of improving and extending the banking facilities and credit system between the countries represented;

A committee on international law, to consist of five members, to report uniform rules of private international law affecting civil and commercial matters and the legalization of documents;

A committee on general welfare, to consist of seven members, to report some plan of arbitration for the settlement of disagreements that may hereafter arise between the several nations represented in the conference, and to receive, consider and report upon any other topics that may be proposed other than those included in the invitation from the Government of the United States.

ARCHÆOLOGY.—The recent discovery of archæological remains by Mr. W. H. Holmes, of the U. S. Ethnolog-

ical Bureau, in the vicinity of Rock Creek, a tributary of the Potomac near Washington, is regarded as of high importance. Within a mile of the city limits a quarry workshop of early stone workers has been unearthed, and can be seen to-day almost exactly as it was left by the ancient workmen. The first discovery of these remains appears to have been made in 1887 by an assistant of Mr. Holmes, who was sketching in the vicinity, and who by chance found an implement in the gravel at his feet. He subsequently came upon a number of heaps of refuse in a ravine. In September, 1889, Mr. Holmes obtained the consent of the owner of the property to work upon the premises. After a careful survey he excavated a trench which cut a section directly across the line followed by the ancient workmen. He found a little below the surface a belt of worked material fifty feet wide and on an average about six feet deep, containing upwards of three thousand specimens. It is probable that the entire site contains over a million finished, unfinished and broken implements. Out of fourteen hundred that have been carefully examined there were only twelve that approached anything like perfection. The conclusion is that the perfect specimens were carried to the villages of the workmen to be completed at leisure. No remnants or traces of tools were found.

An examination of the quarry workshop made it apparent that the period of occupation was very long, but Mr. Holmes thinks there is no geological evidence to carry the history of man in this place back beyond the age of the American Indian.

TIERRA DEL FUEGO.—Capt. St. Clair, of the British steamer *Champion*, reports recent information (March,

1889) bearing on the condition and inhabitants of the eastern coast of Tierra del Fuego. Between San Sebastian and Good Success bays natives were seen at most parts of the coast. Some Europeans engaged in gold mining were seen at Nombre Head, about ten miles northward of San Sebastian Bay, where there were several buildings and a flag-staff flying the Argentine flag. Also, near Cape Medio, some Europeans were found searching for gold. At Good Success Bay an Argentine government settlement was found. At Sloggett Bay a gold mining company is established. The coast is visited every three months by an Argentine government vessel.

La Pallice.—The artificial port of La Pallice, destined to be one of the great ports of France, and begun by the Government some eight or nine years ago, is rapidly approaching completion. The necessity for this work arose from the impossibility of maintaining in a satisfactory condition the harbors of Bordeaux and La Rochelle. The former is obstructed by a bar which reaccumulates almost as fast as it is dredged away, making it dangerous for large vessels, even at high tide, to attempt an entrance. The latter is quite filled up with sand, and the commerce of the place is now confined to coastwise trade in small steamers and schooners.

La Pallice, before this work was begun, was partly in farms and partly in barren sea-coast. It lies on the west coast of France, about four miles west of La Rochelle, and a railroad has been surveyed to connect it with the latter place. The Compagnie Générale Transatlantique is under a contract with the French Government to establish a regular line of steamers to America as soon as the port shall be open.

There are an outer port, inner basin, locks and dry docks. All the excavations were literally hewn out of rock. The masonry is for the most part composed of stones found on the spot, but the walls are faced with granite. About a mile from the entrance are two light-houses, located respectively on the islands Oléron and Ré. The entrance to the outer harbor is to be marked by light-houses, one on either side. This outer harbor has an area of about thirty-five acres with a depth of water varying from thirty-one to thirty-seven feet at high tide, to sixteen to twenty-three feet at low tide. In the inner basin a uniform depth of from twenty-eight to thirty-four feet of water will be maintained. The land surrounding this basin is reserved for wharves, ware-houses, tramways, railroads, and all facilities for handling, moving and storing merchandise. Somewhat over $4,000,000 have already been expended on these works by the French Government. This amount, which it is understood includes also the acquisition of land, seems like a very moderate expenditure, but when the cost of labor, (58 cents a day) which of itself constituted the larger part of the outlay is taken into account, it will be readily seen that equal results in the United States would have involved at least twice the amount.

CADIZ.—The Department of State is advised that an English company is seeking a franchise to build and operate at Cadiz at fixed tariffs a system of deep-water docks of sufficient capacity to accommodate one hundred large ocean steamers. The proposed tariff reduces the present cost of unloading ships 50 per cent. The parties interested are the Spanish Transatlantic Steamship Company, the Andalusia Railroad Company and

the English Dock Company. The railroad company proposes to run trains from Cadiz to London in fifty-two hours, and the steamship company to send a vessel a week to South America and New York. All cargoes for the interior will be discharged at Cadiz and forwarded by rail; and all goods for export, as well as transatlantic passengers will be taken on there. At present, all large vessels discharge to small boats in the bay, and the mails for America, as well as much of the export business of Spain are taken on at Lisbon.

CAPRERA.—In the month of May, 1889, a new submarine telegraph cable was established between Talamone, west coast of Italy and Caprera Island, north coast of Sardinia.

MOSSAMEDES.—Information has been received that, owing to a late convention between Portugal and Germany, the coast line of Mossamedes, south of the Cunene River, has been handed over to the Germans. A cable having been laid between the Cape of Good Hope and Mossamedes, and continued from Mossamedes to St. Paul de Loanda, the telegraphic circuit of Africa is now complete, and communication with the Cape via the west coast may be more expeditious than by the old route via the Red Sea and Zanzibar. A new line of Portuguese steamers to go as far as the Cape and Delagoa Bay was to start in July. From Mossamedes the steamers are to go to Lisbon in eighteen days. It is proposed to start a railway line to go about two hundred miles into the interior.

The climate of this district, situated on the west coast of Africa, between 13° 50′ and 17° 25′ south latitude, is described as excellent, and on the high plains

behind the Schella Mountains as suitable for Europeans. Fever is uncommon, and contagious diseases only appear when imported in vessels, and rarely take the form of an epidemic. The death rate is very low.

ST. HELENA.—Continued decline from its former prosperity is noted in regard to the historic island of St. Helena. The primary cause is the diversion of traffic by the way of the Suez Canal, although other causes, such as the decrease of the whaling industry and different methods of provisioning ships for long voyages, the reduction of the garrison and consequent diminished disbursements for maintenance by the British Government, have had marked effect. It is reported that many merchants have emigrated for the want of business, and that there is not much occupation left for the few who remain. Nevertheless the native population increases, and there is a large surplus of labor on the island. Within a short time the English steamers have offered passage to Cape Town at half rates to encourage emigration.

KOREA.—The following information relating to Ping Yang inlet and Taton Bay, west coast of Korea, is derived from a report by Ensign F. M. Bostwick of the U. S. S. *Palos:* The village at the head of the bight, between Corries Point and Rocky Point, is known as Chang Ihen. The head of Ping Yang inlet receives the waters of two rivers: the Wuel-tang from the southeastward, and the Tatung (incorrectly Ping Yang on H. O. Chart 224) from the northward. The Tatung is much the larger of the two rivers. The town at the mouth of the Tatung is Chel-To. Referring to British Admiralty Chart No. 1258, Tatong River should be

Taton Bay. No river is there. The head of the bay is at the point marked Haiju (Hae-Chow-Poo).

HYDROGRAPHIC NOTES.—Captain John Van Helms of the steamship *Newbern* reports as follows in regard to San Luis Gonzales Bay and Ometepes Bay, East coast of Lower California:

Willard's Point, the northern headland of San Luis Gonzales bay, is about eight miles N. 69° W. from Point Final. From Willard's Point the bay (Willard's Bay) runs in a north westerly direction five miles, and is then separated from a lagoon by a narrow strip of sand. The lagoon is shallow, and abounds in turtle, fish and game. The bay is apparently free from hidden dangers, and affords shelter in all weather and from all winds. There is a depth of from five to ten fathoms of water, and even near the mouth of the lagoon there is said to be five fathoms within a quarter mile from the shore. A poor quality of water was found near the shore of the northern part of the bay. The rise and fall of the tide in Willard's Bay is said to be fourteen feet. Willard's Point is about two hundred and fifty feet high, and on its extremity there is a solitary tree. The river indicated on the chart as emptying into the southwestern part of San Luis Gonzales Bay, was found to be a dry *barranca.*

Ometepes Bay (named by an exploring party on the steamer *Ometepes*), situated about twenty miles southward of Robinson's Landing, Colorado River, in latitude 32° 30′ N, longitude 114° 52′ W., has an entrance three hundred feet wide and a quarter of a mile in length, with a depth of three fathoms of water at half tide. The bay, circular in form, is about three miles wide, and

free from hidden dangers. It is land-locked, and has five fathoms of water. The rise of tide is said to be twenty-five feet. The bay abounds in turtle, fish and game.

Important changes developed by the re-survey in Nantucket Sound, have been indicated upon the charts of the locality issued by the Coast Survey Office since October 31, 1889.

The re-survey of Cape Charles Shoals in 1888, by Lieut. M. L. Wood, U. S. A., assistant in the Coast Survey, has developed a complete change in the shoals off Cape Charles, at the entrance of Chesapeake Bay, and has located a new channel, called the "Northwest channel," across these shoals. This channel has a least depth of twenty-three feet at mean low water. The new hydrography will be shown upon new editions of Coast Survey charts which will be ready about November 15th.

A recent examination of the St. John's River entrance, Florida, by Capt. W. M. Black, U. S. A., Corps of Engineers, has shown marked changes, due to the extension of the north jetty and the work of harbor improvements by the United States Engineers. These changes have been indicated upon the charts issued by the Coast Survey Office since October 25th.

Lieut. T. D. Bolles of the U. S. S. *Monongahela* reports that September 14, 1889, his vessel passed within about four miles of the chartered position of Corinthian Shoal or reef (South Pacific Ocean), indicated in about latitude 8° 55′ S.; and longitude 170° 15′ W. The day was bright and clear, with sufficient sea to have caused a break on the surf, but no indications of a shoal were observed. H.